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B-L-E

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*PERCENT REMAINING ANTIOXIDANT	ANTIOXIDANT B-L-E	ANTIOXIDANT "X"
Unaged	100	100
Aged 72 hours in Oxygen Bomb	67	44
Aged 144 hours in Oxygen Bomb	50	19
Aged 288 hours in Oxygen Bomb	19	6

*Determined by procedure reported by L. H. Howland and E. J. Hart—"Analysis of Rubber for Antioxidants." Presented at Boston Meeting, A.C.S., September 15, 1939.

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Controlling Dust In Rubber Factories

By F. C. Morey

Chief Engineer, Parsons Engineering Corp.

DUST control systems are desirable in the rubber plant for the dual purpose of eliminating the dust nuisance as well as collecting the dust for re-use. The proper design of such systems varies with each application, particularly where specially designed hoods are used to prevent the dispersion of dust into the surrounding atmosphere. There are, however, a number of general rules which may be followed.

The primary consideration is the proper means of effectively controlling the dust at its source. Very few commercially manufactured machines used in rubber plants are equipped with exhaust connections and consequently the majority of dust points are controlled by various types of hoods built to suit a particular requirement. No hard and fast rules can be set up for designing such hoods, as such design will vary with the work being handled and the process involved. The following will be helpful, however:

(1) Enclose the process as much as possible and if this cannot be done place the hood mouth as close as possible to the dust source. Either procedure naturally reduces the volume of air required to control the dust. Enclosures should be provided with work openings and inspection and maintenance doors as required.

(2) Locate the hood mouth or exhaust connection so as to take advantage of air currents from outside sources or from the process itself which have a tendency to direct the flow of dust.

(3) When this cannot be done, baffles or flanges should be used to overcome objectionable air currents, thereby reducing the exhaust volume.

This volume is, of course, figured by multiplying the total open area of the enclosure or hood mouth by the velocity of the air through such openings. This velocity should never be less than 100 feet per minute, and a much safer figure for effective dust control will be 250 feet per minute. This latter figure is particularly applicable to overhead hoods without sides, and which are used over processes where the dust has a tendency to rise. Such hoods should be of sufficient size to extend over the dust source at least six inches on all sides for every twelve inches the hood mouth is above the dust point. Occasionally such overhead hoods are made double; that is, one hood is built inside the other, thereby providing a high velocity air curtain around the hood periphery and consequently reducing the exhaust volume.

The size of the exhaust connection, as well as the

Top: Cloth screen dust arrester used by Goodyear.
Bottom: Similar collector used at another plant.

main, should be such as to provide a velocity of 3,500 to 4,000 feet per minute to the dust-laden air. Higher velocities are not necessary and only increase the resistance against which the fan operates. Branch connections should enter the mains at the top or sides and at an angle of not over 45 degrees. In order to reduce resistance to the air flow, the size of the main should be increased at such points by means of a gradual taper rather than abruptly.

The exhaust piping is ordinarily made of galvanized iron, of riveted and soldered construction, with joints lapped in the direction of air flow. The following gauges have been found to give very good service:

3 to 6-inch diameter, inclusive.....	22 gauge
7 to 12-inch diameter, inclusive.....	20 gauge
13 to 20-inch diameter, inclusive.....	18 gauge
21 inches and above	16 gauge

All elbows, Y's and fittings—2 gauges heavier

It is good practice to provide small air-tight cleanout doors at 10′—0″ centers on all horizontal runs and also to install blast gates at each branch connection for controlling the air flow. After the exhaust system has been balanced for the proper amount of air at each branch these gates should be riveted or bolted in place so operators cannot move them. Unless it is impossible, due to space limitations, elbows should have a center-line radius of twice the diameter of the connected straight pipe. Small radius elbows will wear rapidly, as well as increase the resistance.

The Dust Collector

There are two general types of dust collection equipment—the first employing mechanical or centrifugal force on the dust particles to remove them from the air stream, and the second accomplishing the dust collection by filtration. The cyclone type collector is typical of the first group. This collector causes the entering dust-laden air to spiral centrifugally against the sides of the collector with sufficient velocity to throw out the dust particles, the cleaned air passing up through a central tubular section to the atmosphere. The efficiency of such collectors is increased by increasing the centrifugal velocity, but even then is not sufficiently high to effectively collect the type of dust found in rubber plants.

The wet type collector also comes under this group. This collector generally uses water to first wet the dust particles, thereby increasing their weight, and consequently increasing the collection efficiency. The wetted particles are then thrown out of the air stream by centrifugal or dynamic action and the dust collected in a form of sludge. The efficiency of this type collector will depend of course on the adsorption quality of the dust being collected.

The cloth type of dust collector is the outstanding example of the filtration type. This dust collector consists of a number of bags or flat screens housed in an air-tight sheet metal case with hopper bottom. The dust-laden air passes through the cloth at low velocity, the cloth acting as the collecting medium. Such collectors are shut down for several minutes every four to eight hours for the purpose of shaking or rapping the cloth to remove the collected dust. This type collector requires more space but has a high collection efficiency and the additional advantage of returning the dust for re-use in the dry state.

The selection of the proper type of dust collection equipment and grouping of same should receive a careful study from an operating standpoint. Space requirements, power required and collection efficiency vary with each type, and individual requirements will govern the kind of collector applicable. Ordinarily, several smaller systems offer more operating flexibility than one large system. The size of the collector depends primarily on the volume of air handled, as well as the fineness and concentration of the dust particles.

Several types of fans are suitable for dust collection work, but ordinarily the planing mill exhauster type, as made by numerous manufacturers, is selected. This type fan will operate against static or resistance pressure as high as 15 inches of water, and several designs of wheels and housings are available. The dynamic type wet collector employs the fan wheel itself as part of the collector. In the majority of cases, the fan is placed on the suction side of the collector so that it handles only clean air, and normally is V-belt driven rather than direct connected to motors. This arrangement allows for variation in speed in case of changes in the exhaust system. It is recommended that the discharge from the fan be led to the outside atmosphere. The static pressure against which the fan is to operate is the sum of the following losses:

(1) The inlet loss into the branch furthest from the collector.

(2) The total loss from this connection through the main line, taking into account losses in elbows, fittings, and various connections.

(3) The loss through the collector which includes the inlet and outlet loss, as well as the resistance set up by the collector proper.

(4) The loss in the clean air connections between the collector and the fan, as well as the fan discharge.

All exhaust systems should receive periodic inspection by a capable member of the plant engineering or maintenance department. This inspection should cover the exhaust piping, as well as the dust collector, and any maintenance required should be taken care of immediately. Many plant engineering departments make regular tests of the whole exhaust system and keep records of the air handled, amount of dust collected, and other pertinent data which will prove invaluable in the design of future systems.

The material on vacuum cleaning equipment and comments from rubber manufacturers which appears on the following pages was compiled by THE RUBBER AGE and is intended to supplement Mr. Morey's article.

Vacuum Cleaning Equipment for Rubber Factories

FROM the foregoing it can readily be appreciated that controlling dust in the rubber factory is essential to the proper operation of that factory. As one prominent manufacturer of dust collection equipment puts it, unless dust is kept under control by modern methods business may suffer from either reclamation, contamination, breakdown, working efficiency or good will losses.

There is no argument with the fact that the first step in dust elimination in rubber factories should be the installation, wherever possible, of low-pressure dust collecting equipment at the point of origin to prevent its spread to other parts of the plant, as described in the foregoing article. However, no matter how thorough the installation of such equipment, there is some dust seepage from rubber manufacturing and handling equipment. Then, too, like all other manufacturers, the producer of rubber articles has the problem of ordinary dust from moisture and other sources. Therefore, the collection of floor, wall, ceiling and other dusts must also receive consideration.

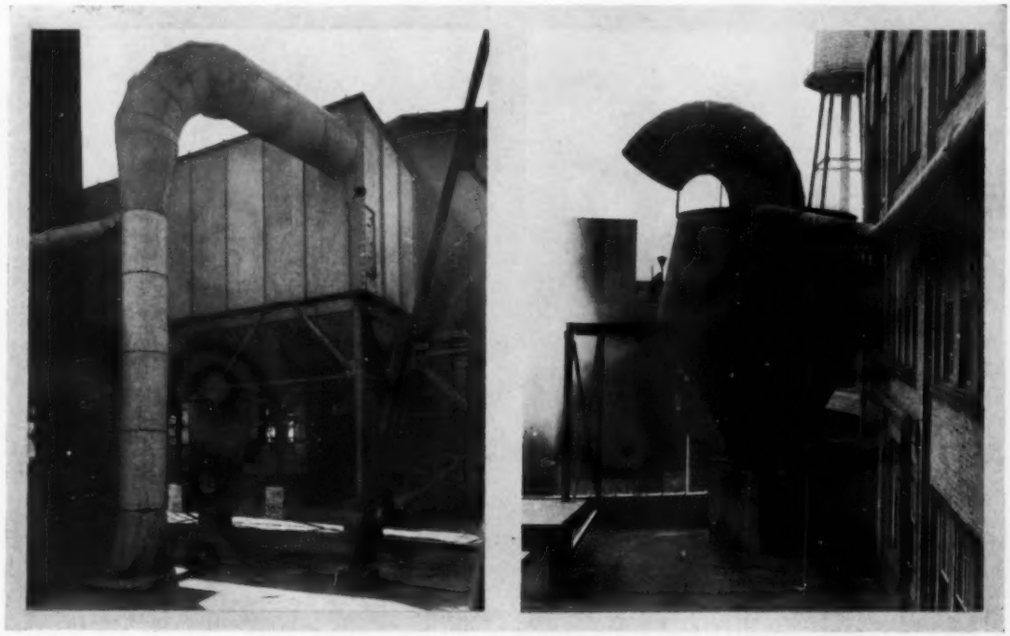
Brooms, of course, are in evidence for sweeping dust from floors in practically every factory. In recent years, however, the lowly broom has steadily been losing ground to mechanical appliances, particularly of the vacuum cleaning type. The products of the United States Hoffman Machinery Corporation are typical of the vacuum cleaning equipment being adopted by industry in general. Accordingly, the following description of this equipment, and the various types applicable for specific purposes in the rubber factory, prepared by U. S. Hoffman engineers, is of definite interest in connection with the control of dust.

Many rubber manufacturing plants have discontinued or at least largely reduced the use of ordinary broom sweeping methods in favor of vacuum cleaning methods. Where floors are swept dry the brooms stir up the dust only to have it settle elsewhere. This usually necessitates duplication of cleaning and of course eventually means considerable overhead dust accumulation. Where floors are wet down before they are swept, only a certain amount of material is removed and when the floors dry out there is still a dry coating of dust remaining. With such conditions there is a constant rehandling of dust which usually makes for more dust.

Vacuum-cleaning equipment can be and is being used successfully for rubber plant cleaning. However, it is essential that the proper size and type of equipment be selected in order to give the most economical and practical results. There is vacuum cleaning equipment available today of proper type to meet almost every condition. The conventional type of small light-duty machines are not suitable because they are not built to stand continuous duty service and of course do not have the capacity to give economical and practical service. Heavy-duty vacuum cleaning equipment both of the portable and stationary type is available to meet the different conditions encountered for the various types of rubber manufacturing plants.

Where the dust accumulations each day are quite heavy on the floors and there is the necessity for several sweepers working simultaneously, then the stationary type of system usually works out more economically even though the first cost is higher than heavy-duty portable equipment. With stationary systems more than one floor may be piped to provide service. With the stationary type of system having centrally located dust collectors, all the material is drawn to one location. The location of the dust collectors may be so arranged that the material can be dumped at points where there is no further rehandling. The size of collectors can be arranged so that it will be necessary to empty them only once a day. This is another advantage over portable units. It is possible to have auxiliary primary collectors confined to certain departments where the material may be salvaged, particularly where one kind of material is being handled consistently.

Floors that are vacuum cleaned are thoroughly cleaned and no dust is raised. After the cleaning nozzle passes over the surface all dust is absorbed and therefore there is no dust raised to be scattered elsewhere as in the case of broom sweeping. This not only makes for plant improvement but materially improves the working conditions of the operators.



Left: Dust arrester installation at a large plant showing good piping design.

Right: Cyclone arrester used by Goodyear for high concentrates of dust.

Perhaps one of the most important advantages of vacuum cleaning equipment and one that is not thoroughly appreciated is what can be accomplished on wall and overhead cleaning work. This is a type of cleaning that is perhaps more neglected than anything else. Without vacuum cleaning equipment there is really nothing else to do but allow dust to accumulate in such locations, simply because it is difficult to get at the work and in most cases being a very expensive job. Dust that is allowed to accumulate on walls and overhead structures discolors the paint and often newly-painted surfaces are soon discolored and the expense of painting is definitely lost. Dust that is frequently removed from such surfaces is not given a chance to become imbedded and therefore newly painted surfaces will look new a longer time.

Overhead piping is a common place for dust to accumulate and be allowed to stand for a long time. The main reason for this is because "it is hard to get at." Without vacuum cleaning equipment it usually becomes necessary to get on a stepladder and the cleaner can work only a few feet and then it is necessary to move the ladder or platform. With vacuum cleaning equipment much of this work can be reached from the floor with long extension rods and cleaning nozzles.

Dust coming from the various kinds of rubber compounds that are used can be and are being successfully handled by vacuum cleaning equipment and if the proper type of heavy duty vacuum cleaning equipment is employed it will usually be found to be economical and effect definite savings over broom sweeping methods.

Dust Control Comments from Rubber Manufacturers

AS INDICATED, the control of dust is a general problem shared by all rubber manufacturers, although the proper design of dust control systems varies with the specific problems involved at each factory. What are some of these specific problems? How does the rubber manufacturer feel about dust control? At which points in the rubber factory is dust control essential? These, and other specific questions, are answered in comments secured from various rubber manufacturers in connection with this article on dust control.

The factory manager of a large tire plant advises that the company uses elaborate measures to control dust and fumes. If complaints of any kind are received from the production organization or from the workers, a thorough investigation is launched and sometimes representatives of the company's insurance underwriters are called in to investigate so that an impartial opinion may be had. Accordingly, as a result of this close watch on the situation, practically every operation at this tire plant where there is any considerable amount of dust or fumes is provided with exhaust equipment.

There are hoods over the mills at the plant, forced draft exhaust over all buffing operations and painting jobs, and at several cleaning operations. An exhaust system in the curing department carries off dust and fumes. The tube department has several of these exhaust systems. The bead department, in which it is necessary to carry on a considerable amount of soldering, is equipped with an exhaust system at each machine.

Some time ago, an elaborate tank and convevor system was installed at this factory for handling carbon black. The black is conveyed from freight cars on tracks outside the plant directly into the mixing machines. This has accomplished much toward improving the cleanliness of those departments where carbon black was formerly handled. Incidentally, it was discovered in some cases that through the elimination of fumes the paint on the factory walls deteriorates slower and actual savings result. In conclusion, the manager of this tire factory states that "a liberal policy on the installation of exhaust equipment is reflected in the improved health of the workers and improved morale."

The factory manager of a large mechanical goods plant in the east finds that the control of dust is "a most important item, both in the interest of health for our employees and as a matter of good housekeeping for the plant." Beginning with the mixing de-

(Continued on page 376)

Left: Dust elimination system used by large rubber manufacturer in connection with the blast cleaning of molds. Right: Typical air filter system, suitable for low concentrations of dust, used in one of Goodyear's factories.

Advances in Latex Technology

By Royce J. Noble

Consulting Technologist and Author of "Latex in Industry"

PART I.

IN A rapidly growing industry it is desirable to review progress from time to time—to count our failures as well as our successes, and determine so far as possible how we may best profit from both. It is now more than three years since any comprehensive survey of advances in latex technology has been made —a comparatively long time in so young an industry. Within that period much progress has been made in all branches, from methods of production, shipment and concentration to applications, in an ever-increasing roster of manufactures.

Imports

It is recorded that the first importation of latex to the United States occurred in 1835, and comprised 40 to 50 casks purchased by Charles Goodyear *(1)*. Over the period of 1935 to 1939, imports of latex increased from 13,500 tons (dry weight), having a value of $3,800,000, to 27,500 tons, valued at $10,470,000 (Fig. 1). From the beginning of 1935 to the end of 1937 the use of latex was increasing rapidly, but with decline in business and because of accumulated stocks, imports in the second and third quarters of 1938 fell off sharply. During 1939 imports again increased, both the tonnage and value attaining new high levels, due in no small part to increasing manufacture of latex thread, sponge and cements.

It is true that latex consumption is still small when compared to that of crude rubber, accounting for only about 4% of total rubber imports. Users of latex in large quantities are still small in number. According to the *Rubber News Letter* of August 15, 1939 (Leather and Rubber Division, Dept. of Commerce) ten firms reported a total consumption of 12,000 tons, forty smaller firms reported a total consumption of 1,800 tons, and 72 small users a total of 47 tons. While the various latex applications may at most constitute only an infant industry, the infant is nevertheless, someone has observed, a healthy one.

Developments in the field of latex technology occur far more rapidly than in other fields of rubber. These developments range from methods of handling on the plantation to the manufacture of finished goods. For this reason, we asked Dr. Noble, prominent latex consultant and author of "Latex in Industry", to prepare a series of articles for us reviewing developments in recent years. This review, the first part of which is presented in this issue, will cover methods of production and handling, preservation, compounding, coagulation, rubber powder, testing, and applications.—EDITOR.

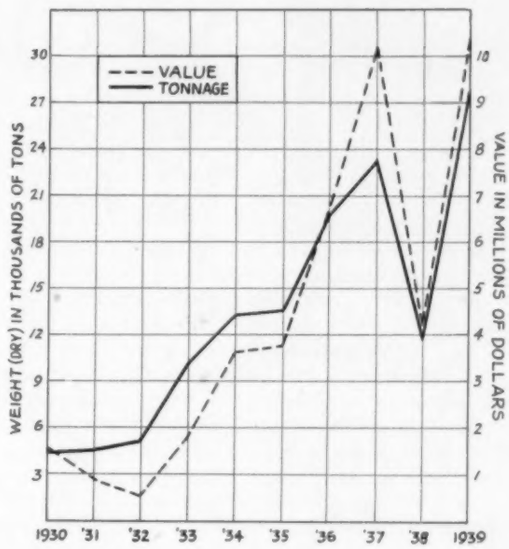


FIG. 1

Production

While Malaya and the Dutch East Indies, where several American companies have large holdings *(2)*, are the most important latex-producing areas, the Liberian Firestone development, begun several years ago, is fast becoming of importance. Liberian production increased from 117 tons in 1934 to 709 tons in 1936; the estimated latex production for 1939 is 2,500 tons. Of one million acres leased, approximately 70,000 acres are now under cultivation, of which 15,000 acres are clonal plantings. In 1940, over 35,000 acres will be in bearing. Production is largely in the form of latex, which for the most part is used in the Firestone factories.

With increasing use of latex, purchasers' specifications have become more strict. As a result production has been limited to a relatively small number of the larger estates, which are equipped to bulk in quantities of several thousand gallons and to exercise some control over the product. Proper preparation of the latex for the market and maintainance of a uniform good quality are essential. Thorough and regular disinfection of bulking tanks, pipe lines and other equipment is required. Through cooperation of producers, consumers and research institutions in the producing countries, a marked improvement in quality has been effected *(3)*.

Discoloration

It has been shown by Roberts *(4)* that sulfur compounds are always present in latex, and that in the presence of ammonia, soluble sulfur compounds are formed which can react with iron salts. Any delay in preservation after tapping increases the possibility of

discoloration in contact with iron. It has been found necessary, therefore, to observe suitable precautions in lining bulking tanks and drums to prevent a reaction resulting in discoloration of the latex. Paraffin, resins and bitumens have been used for this purpose but are not entirely successful. A zinc oxide-latex lining entirely prevents discoloration, but has the disadvantage of causing a decrease in stability of the latex. In the case of bituminous materials, a minimum of two coats is required. It should be noted also that iron itself is undesirable in latex. In addition to causing discoloration, it accelerates oxygen absorption and leads to rapid aging and deterioration.

Preservation

For several years the desirability of using a minimum of 0.7% ammonia for sterilization of field latex has been recognized and at present most producers are complying with the recommendation of the Rubber Research Institute of Malaya in this respect. Smaller amounts are not sufficient to prevent bacterial activity in all cases and an excessive ammonia content presents numerous disadvantages.

The need for an alternative neutral preservative has arisen from difficulties experienced with ammonia-preserved latex in certain technical operations *(5)*, its destabilizing effects in the presence of zinc oxide, and because of its objectionable odor. Much work has been done on the examination of sterilizing and preserving agents by numerous research organizations. With few exceptions, the bactericides tested have failed to meet the many requirements as to toxicity, stabilizing properties, effect on color, cost, etc. *(6)*. There is much interest at present in a chlorinated phenol, which has been subjected to extensive tests in Malaya *(7)*; other preservatives offering possibilities in latex are parachlormetacresol, sodium orthophenyl phenate, hydroxylamine *(8)*, silica salts *(9)* and zeolites *(10)*.

Preservation of ammonia-free latex by sterilization at 120° C. in the presence of a buffer maintaining the pH at 7.0 has been accomplished by Spence *(11)*. Permanence of the physical and chemical properties of the latex and rubber is claimed. It is of interest that rubber obtained from latex so treated is more plastic than that from the usual ammonia-preserved latex, and breaks down more readily on the mill. Preservation with relatively large amounts of formic acid, added to the latex in the field, has been attempted but has not given entirely satisfactory results. The latex remains fluid, but is unstable and appears to be micro-flocculated. Saponin greatly retards the flocculation *(12)*.

Latex from some sections of Indo-China are more acid than Malayan latex; a preservative used for such latex is a mixture of soda, paranitrophenol and sodium sulfite *(13)*. A method of preservation suggested by O'Marchal *(14)* involves several steps. He proposes purification by centrifuging, replacement of electrolytes by a base-exchange process, and addition of an antiseptic.

View on one of Firestone's plantations in Liberia. More than 35,000 acres will be in bearing in 1940.

Shipment

While a large proportion of all latex is still imported in drums of 30 to 55 gallons capacity, bulk shipment from the East has greatly increased in the last two years. Stations for receiving and handling bulk shipments have been constructed at Boston, New York and Baltimore. Early shipments were commonly made in forepeak tanks having capacities of 25,000 to 40,000 gallons. Flange plates on the ships' sides permitted making pump-line connections. Recent shipments have been made in larger tanks located amidships, the latex being removed by pump-line over side.

The pumping equipment used is of the centrifugal type, capable of handling up to 24,000 gallons per hour through a 4-inch hose. The design is such as to prevent coagulation of the latex and clogging of the line. It is usually necessary to pump the latex to a height of 30 feet or more above the water level to horizontal storage tanks which have a capacity of 10,000 to 25,000 gallons. The storage tanks may be connected by pipe lines, and equipped with stirrers. From these tanks the latex is drummed or loaded in tank cars by gravity feed for inland shipment.

Properties

Constituents: Two different proteins have been isolated from preserved latex, differing essentially in their solubilities and electrokinetic behavior *(15)*. The substance designated as Protein A is insoluble in water and alcohol and has an isoelectric point at pH 4.55. Protein B is soluble in water and 70% alcohol and has an isoelectric point at pH 3.9. A comparison of the change in electrophoretic mobility with pH of the protein and of latex particles leads to the conclusion that the behavior of the particles is dependent upon their protein coating, Protein A being dominant in this respect. The proteins are partially precipitated when the latex is heated to above 80° C. and the isoelectric point of the latex is not greatly changed by this treatment *(16)*. The adsorbed protein (Bondy's Protein A) is also assumed to be unchanged.

The work of Roberts *(17)* on the isolation and quantitative determination of the constituents of Hevea latex is of the greatest importance as a contribution to our knowledge of the subject. He stresses the natural variations in the composition of latex, depending upon the factors of soil, climate, strain and topography. Several substances hitherto unknown to be present in latex is heated to above 80° C. but the isoelectric point taining plastic, a major component of the non-rubber material. It has been shown that the better known components exist in the fresh latex in the form of stable complexes.

Ammoniation of latex causes many changes in its composition *(18)*. The complexes containing the fatty acid and phosphate groups are hydrolyzed. There are changes in acetone extract, surface tension and viscosity values. It is also possible some change takes place in the hydrocarbon; Roberts has indicated that

the crude caoutchol, which may amount to 7 per cent of the rubber, is rendered insoluble.

Stability: The potential of the electrical double layer on the latex particles has been measured by Hauser and Bender *(19)* as —97 millivolts. Blow *(20)* finds, however, that the potential of the double layer may range from —40 to —100 millivolts, the value being inversely proportional to the content of serum solids in the latex. From changes in cataphoretic velocity and hydroxyl ion concentration, Hauser determined that decrease of stability and coagulation, resulting from addition of excess alkali, is due to adsorption of positive alkali metal ions. It is of interest that no change in the particle charge occurred after heating to temperatures as high as 164° C. Jordan *(21)* has found that the maximum stability is realized when caustic potash is added in the amount necessary to react with the buffer substances, this addition resulting in a pH of 10.5 to 11.0. At alkali concentrations greatly in excess of the optimum value stability again decreases.

Specific Gravity: The value first suggested by Rhodes has been recalculated by him *(22)* to be 0.9064 for the rubber of ammonia-preserved latex. DeVries *(23)* has pointed out that Rhodes' figure is actually the specific gravity of "crepe rubber in preserved latex," and further that the specific gravity so determined depends upon the rubber content of the original latex. Purification of normal preserved latex by repeated electrodecantation has enabled Schmidt and Stamberger *(24)* to calculate the specific gravity of the rubber phase as .905. Since their calculations were based on the percentage of rubber by weight rather than by volume the corrected specific gravity would be .907 *(23)*. Van Gils' determination *(25)* on purified latex obtained by centrifuging a dilute latex gave a figure of .904.

Viscosity: The viscosity of latex is a property of both practical and theoretical interest. Rhodes *(26)* has recently investigated this subject, using a large number of preserved field latices and latex concentrates for his observations. The relationship of viscosity to both temperature and dry rubber content was determined, and mathematical expressions derived to express their relationships. For an "average" latex Rhodes' work is summarized in part as follows, the viscosities being given in centipoises at 30° C.:

Ammoniated Field Latex: $\log n = 0.055 + 0.938 \tan p^*$

D. R. C. per cent	0	2	4	6	8
20	2.49	2.72	2.97	3.26	3.58
30	3.95	4.38	4.87	5.45	6.14
40	6.95	7.94	9.14	10.62	12.50
50	14.89	18.01	22.18	27.90	35.90
60	47.83	65.94	95.10	145.14	238.03

Centrifugal Concentrates: $n = -228.4 + 4.525\ p^*$

56	25.0
58	34.0
60	43.1
62	52.1
64	61.2

*p = per cent dry rubber content expressed in angular measure.

It has been pointed out by Twiss and Carpenter *(27)* that the change in viscosity with temperature is of such small magnitude as to preclude the possibility of any high degree of hydration of the latex particle. The effect of concentration and temperature on the viscosity of latex has been studied also by Dogadkin and Kovarskaya *(28)*.

Bachle *(29)* has found that the viscosity-concentration curve of latex does not approximate the Einstein formula but is in good agreement with that of Guth *(30)* up to concentrations of 45%. He suggests a formula corresponding to the data obtained with the Hoeppler viscosimeter. It is also suggested that the increase of viscosity in compounded latex results not from incipient coagulation but from vulcanization.

Unloading latex by pump-line from tanks located amidship at Goodyear's new dock in Baltimore, Md.

Particle Size and Count: Lucas *(31)*, on the basis of observations with the ultraviolet microscope, has determined the average particle size in preserved latex to be 0.26 microns. The average mass is calculated to be 0.045×10^{-12} grams. From this data Kemp *(32)* has calculated the number of particles per gram of latex of 40% content to be 47×10^{12} grams, a figure far in excess of the earlier observations of Henri *(33)* and Langeland *(34)*. It would appear, however, that the work of Lucas and the calculation of Kemp are open to criticism.

As has been contended by Hauser and Bender *(19)*, Lucas' method of observation is such as to change the shape of the particles. Further, Lucas' measurements of the particles were done by projection on a screen at a total magnification of 21,600. At this magnification approximately 85% of the images measured less than 7 mm., the maximum number being 3 mm. It is probable, therefore, that all the smaller images would tend to appear to be round, whatever the true shape of so small a particle might be.

No attempt at differentiation between rubber particles and other non-rubber material in suspension was made by Lucas; he states, however, that only about 18% of the mass has a particle size below 0.5 microns, and a particle mass below 0.1×10^{-12} grams, while nearly 50% has a diameter above 1 micron and a particle mass above 0.5×10^{-12} grams. Much of this material of extremely small size may well be non-rubber substance, in which case Kemp's calculations should be revised. One gram of latex of 40% solids would have a dry rubber content of approximately 0.37 grams. Using only 92% of the mass having the largest particles (corresponding to the dry rubber content instead of total solids) Lucas' results become:

Average diameter .....0.94 microns
Average mass .....0.65×10^{-12} grams

The number of particles per gram of latex of 40% solids (37% rubber) is:

$$\frac{0.37}{0.65 \times 10^{-12}} = .57 \times 10^{12}$$

Reduced to the basis of 35% rubber content, this value becomes $.54 \times 10^{12}$ grams, a figure somewhat lower

than Langeland's but probably more nearly representing the actual number of rubber particles than does Kemp's result.

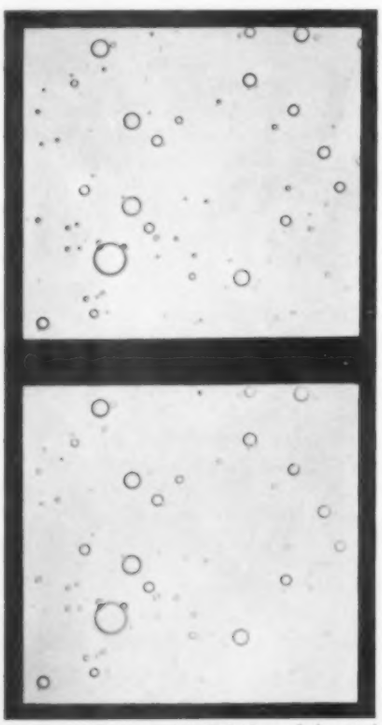
Miscellaneous Latices

Jelutong latex has been examined by Daniel, Freundlich and Sollner *(35)* who find that this highly resinous latex contains only one kind of particle, and that it is not ampholytic in its behavior. It is readily oxidized through the action of enzymes, becoming increasingly stable; it coagulates but slowly with acids.

The same investigators have also made a study of the latex of *Ficus Elastica (36)*. When preserved with ammonia, this latex is very stable, being difficultly coagulated by any reagent. Unlike the resins of Jelutong latex, those of *Ficus* latex appear to be dispersed as individual particles separate from the hydrocarbon but of nearly the same size.

An extensive study of the properties of balata latex has been made by Kemp *(37)*. Because of the water-soluble protective agent in the serum it cannot be coagulated by acids or salts; alcohol causes rapid coagulation. New analyses of the latex, resins and ash, as well as determination of the physical constants of the balata hydrocarbons, have been made.

Poinsettia latex has been investigated as a possible substitute for Hevea *(38)*. It is derived from a variety of poinsettia bushes in Mexico and may be preserved and coagulated by the same methods as used for ordinary latex. According to claims made, the rubber derived from it has greater tensile strength, elasticity and elongation than standard commercial grades.



Courtesy, Bell Telephone Laboratories
Balata latex particles, X 1800, taken with ultra-violet microscope

Abiarana gutta percha latex has been examined by both Stevens *(39)* and Daniel, Freundlich and Sollner *(40)*. The latter conclude that it has greater stability than Hevea latex, that the stability is due to unidentified adsorbed substance on the surface of the particle, and that the particles carry a negative charge.

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(The second part of this series by Dr. Noble will appear in the next issue.)

Dura-Bond Process

THE successful development of a method for bonding soft rubber and neoprene to steel and aluminum by hot vulcanization has been announced by the Hewitt Rubber Corporation, Buffalo, N. Y. Called the Dura-Bond Process, the new method is said to eliminate the use of a hard rubber base next to the metal core and brass plating of the metal. It is said to produce an adhesion strength of 500 to 750 pounds per square inch and to result in finished products with good aging qualities. With reference to heat conditions, Hewitt limits its recommendations to temperatures not exceeding 200° F., although efforts are being made to extend the range of temperature service conditions to at least 250° F. Use of rubber-metal vulcanized combinations appear to be increasing rapidly in the automotive, transportation and mechanical goods industries. These products combine the abrasion and corrosion resistance as well as the sound-dampening properties of rubber with the strength and rigidity of metal.

Builders of Rubber

Forthcoming Celebration of the 70th Anniversary of the B. F. Goodrich Co. Recalls Exploits and Efforts of the Early Pioneers Who Created the Foundation for the Rubber Industry of Today Out of the Inventions of that Immortal Inventor — Charles Goodyear.

By Ralph H. Wolf*

IMAGINE, if you can, the world without one of its great raw materials. Not some paltry stuff, easily dispensed with, but one of the great essentials which are the bones of civilization—iron or copper or wood or stone. Suppose that iron was unknown to us and then one day a man came clamoring into the market place with a new thing in his hands, "Look what I have here! It is something I call iron and you can do this with it and this and this and this," and went on to show us all of the things we know can be done with iron. We should think him a great fellow and immediately name babies, boulevards, cheroots, race horses, and two kinds of candy bars after him. But would we be able to identify the name again tomorrow?

Fantastic, you say, because these materials have so long been known, even back to the very verge of history. True enough, but it was only a year and a century ago — not even a minute on one of H. G. Wells' time diagrams — that a man did come along with a new thing under the sun, one that has become as necessary to modern civilization as those already mentioned.

The "stuff" was vulcanized rubber, as commonplace to us as iron or wood. Like his bright but ape-like ancestors who discovered the merits of those things, the discoverer of vulcanized rubber until last year was as little known to the general public. Today, through the medium of his first biographies in book form, through newspaper and magazine articles, through the unveiling of his statue in Akron, and the dedication of an American Chemical Society convention to his memory, the name of Charles Goodyear has become a familiar one to the populace for the first time.

But what of the three men who did most to build the rubber business up to the billion dollar status it now has in this country? None of them have received even a small percentage of the honor that is their just due. Along with Goodyear, the bankrupt Yankee hardware merchant, this trio forms an oddly assorted quartet, the other members being respectively a none too successful country doctor, a son of a small town mower and reaper magnate, and a peddler of *Wild Rose* lotion and *Arabian Oil* horse liniment.

* Co-author of "Rubber: A Story of Glory and Greed."

Dr. Benjamin Franklin Goodrich

As has been said, Goodyear no longer needs biographical treatment as a result of the recognition he received in 1939. Consider then the next of these builders of rubber; next in point of time; next because he, more than any one else, was responsible for the rise of the present day industry; and next because he is as little known to the general public today as Charles Goodyear was a year ago and needs more introduction than the other two who, contemporary with our times, are better known.

This feckless physician was founder of the first of the "Big Four" companies which this year celebrates its seventieth anniversary; his success was to be the inspiration for the founding of two more of the remaining three; and the mushroom growth of this trio was to carry a little canal town of less than 10,000 people in Ohio's Western Reserve to the position of "rubber capital of the world." He was Dr. Benjamin Franklin Goodrich, founder of the company which has borne his name for the past seven decades, and the scene of his success was Akron.

In more ways than mere similarity of names did the career of Goodrich parallel that of Charles Goodyear. His was a New England ancestry also and, like Goodyear, he turned to an entirely different profession in middle life after he had been unsuccessful in the career chosen in his youth. Like Goodyear he was devilled by ill health although he never knew the terrible poverty and the debtor's cell that were so great a part of the inventor's career.

Two years after Goodyear's discovery of vulcanization, Benjamin Goodrich was born on a farm in Ripley, New York. He was not to know his parents long for his father, Anson, died in 1847 when the lad was six and his mother, Susan Dinsmore Goodrich, two years later. After his mother's death young Goodrich went to live with Uncle John Dinsmore and learned his reading and ciphering under the stern eye of Volusia Haight who was hired to tutor his cousins. When

he was fifteen he spent a year at a boy's boarding school in Austinburg, Ohio. Another year was spent at Fredonia, New York, Academy and he then began studying medicine with his cousin, Dr. John Spencer, in Westfield, New York. A short additional apprenticeship was spent under Dr. George Bennett in Ripley and then in the fall of 1859 Goodrich entered the medical department of Western Reserve College in Cleveland. The path of the medical student was not a difficult one in those days and the future rubber baron graduated as a full-fledged doctor in 1860. In July of that year he went to Mayville, New York, and had his office, room and board in the Mayville Tavern, kept by one Horace Gifford.

Served During Entire Civil War

The Civil War broke out the following year and Goodrich was eager to go. His practice amounted to nothing and he was without money and necessary clothing but his sister, Mrs. Harvey Tew, fitted him out, gave him a twenty dollar gold piece and sped him on his way to Albany. The boy doctor passed his examination and became hospital steward with the Ninth New York Cavalry. From this lowly rank he rose to assistant surgeon of the company and then to the same position with a batallion of engineers. Excepting for one winter off for a much needed course in surgery at the University of Pennsylvania he remained with the battalion until the end of the war.

After Appomatox had ended the four bloody years of strife an immediate return to the dull life of a country practitioner did not appear attractive to the young doctor. Instead he tried his luck in the new oil territory in Pennsylvania. The wells he sunk at Pit Hole, Tideout and Rouseville all proved dry holes and he went to Jamestown, New York, to try medical practice again. This proved no more profitable than it had been before and in the spring of 1868 the doctor turned his back forever on medicine. Going to New York City he entered the shipping department of Brown Brothers Oil Company. At his boarding house on Fourteenth Street he became acquainted with lawyer John P. Morris who interested the reformed medico in Brooklyn real estate. The venture proved profitable and the partners began looking for other lines in which they could turn an honest penny. On July 15, 1869, they traded ten thousand dollars worth of lots to Ezra Frost for fifty shares of stock apiece in the Hudson River Rubber Company, at Hastings-on-the-Hudson, N. Y.

The new stockholders soon found that the company was in bad shape financially when President Sheldon applied to them for money with which to operate. Goodrich had no money and Morris refused to advance any to operators already proven incompetent. Goodrich proceeded to argue the older shareholders into swapping their holdings for more lots in 1870 and Morris was then willing to advance $5,000 for working capital. With the latter as secretary-treasurer and the former as president as well as the active manager of the factory, the business limped along. The machinery was in bad shape, the factory rent was too high and when Goodrich heard of a bargain in rubber factories at nearby Melrose he was quick to seize it.

The best of the Hastings equipment was moved to the new plant but to no avail. In less than two years the factory was running behind and the doctor announced that he would have to have more money or else close up and sell out the business. Morris had other ideas. He wrote later: "I said I had ten thousand dollars in there and did not feel like putting in any more, that the competition in the east was too great for a small factory like ours. I thought if one was started out west where there were then no factories, and he could get enough money so he would not be cramped for two or three years that he would succeed in the business."

The idea sounded good to Benjamin F. and he visited a number of cities throughout the mid-west. At this opportune moment there fell into his hands a pamphlet which a volunteer board of trade in Akron had issued towards the end of the 1860's. The booklet announced that the town of ten thousand was "hot" for having some new industries, that it was ideally situated and that it was willing to be more than generous with newcomers.

Akron had its founding in 1825 when General Simon Perkins dreamed of a city to stand on the highest point along the Ohio Canal, then being built to join Lake Erie with the Ohio River. His surveyors chose the spot traversed by the Old Portage, the trail used for years by 'coon-capped frontiersmen making their way from Great Lakes to Gulf over a wilderness highway used for decades unknown by their red predecessors. Irish laborers on the canal built themselves slab shanties and later, as the ditch crawled southward, some of them stayed on to inhabit a section called Hell's Half Acre and noted for its turbulence. Wily Yankees from other parts of this territory that not long before had been part of Connecticut's Western Reserve came drifting in to the new town. Then came a small wash of Germans ahead of the big wave that swept on to Wisconsin; their section was Goosetown and their children the natural foe of the neighboring Irish.

Akron—the name is from the Greek for a high place—had a small boom in 1840 when it became a cross roads of mule-drawn traffic as the first boats arrived from the east over the new Pennsylvania and Ohio Canal. This midwestern village Venice was to be variously known as the sewer-pipe city, the match city, the oatmeal city and the reaper city before Dr. Goodrich arrived to start the enterprise which was to make it world famous as the Rubber City. At the time the rubber man was allowing himself to be seduced by the hopeful board of trade, the town's industries included the cereal mills of Ferdinand Schumacher, first president of the American Cereal Company, vast combine now known as Quaker Oats; the Buckeye Mower and Reaper Works of George Crouse and Lewis Miller, the latter better known as the founder of Chautauqua and father-in-law of Thomas Edison; the Empire Mower and Reaper Works of J. F. Seiberling, whose son was to found one of the world's largest rubber companies; and the match works of Ohio Columbus Barber, promoter and, for long, president of the great Diamond Match trust.

Money Raised by Akron Citizens

Colonel George Perkins, grandson of the city's founder, son of abolitionist John Brown's one-time partner in Akron sheep raising, was head of the board of trade. Goodrich came to town and interviewed Perkins who called a meeting of leading citizens at the Empire House. Result was that Perkins was sent east to investigate the Melrose plant and when he returned he persuaded twenty-two other civic boosters to raise a loan of $13,600 to be placed at the disposal of the enterprise. With Goodrich came his brother-in-law, Harvey W. Tew, of Jamestown; $5,000 supplied by the still optimistic Morris; and the machinery from the Melrose plant, the latter slightly delayed as a result of being seized for rent due on the Hastings factory.

View of the original Goodrich plant in Akron about 1871.

A small building was erected near the canal in South Akron and in 1871 the twenty-five workmen of Goodrich, Tew and Company turned out fire hose, wringer rolls, and belting to the extent of $49,403. The concern limped along but by 1874 it became apparent that, without fresh funds, it was headed in the same direction as the doctor's previous companies. The original partnership terminated in September of 1874 with Tew selling his quarter interest for $7,500. Goodrich's struggles to finance the company at this time are reminiscent of the trials Charles Goodyear underwent in the 1839-45 period when he was unable to convince anyone of the merits of his vulcanization discovery. Goodrich faced the same discouragement for the people of Akron were exceedingly dubious of the future of his company. In April, 1875, Board of Trade head Perkins was prevailed upon to finance the company by endorsing its paper and making loans. This agreement lasted until 1878 when, as had happened to Goodyear, Goodrich's backer encountered financial troubles in another concern and was forced to end the agreement.

The collapse of the company seemed inevitable. Its credit was practically non-existent. Inadequate capital, inadequate raw material supply, inadequate working force were the fetters in which it seemed inextricably bound. Every man of any financial standing in town turned down the doctor's cajolings. Goodrich had, however, the same kind of optimism and perseverance that Goodyear had displayed and finally convinced George Crouse, reaper baron, b a n k e r and political power, that he should step into Perkins' shoes. With a $35,000 mortgage on all of the firm's property in his hand Crouse was willing to assist by endorsing and negotiating its notes.

Goodrich Incorporated in 1880

Everything looked brighter for the little concern and in 1880 the partnership was dissolved and the B. F. Goodrich Company incorporated with capital of $100,000. The original backers were given their choice of stock or cash payment. All but Crouse and Perkins elected to take cash and thereby cut themselves out of the millionaire class into which they would have fallen had they taken shares. Goodrich was president of the new company which flourished from the start. Two years after incorporation, the capital was doubled; in 1889 it went to $500,000 and in 1895 to $1,500,000, so rapid was the increase in popularity of rubber goods in general and of the Goodrich product in particular. The $300,000 of sales in 1881 had increased to over a million a decade later, hit five million in 1900 and shot up to nearly ten million five years after that.

Founder A Democratic Soul

Benjamin Goodrich, whose unending perseverance was responsible for pulling one of the world's greatest rubber factories through its formative years, was a democratic soul. It was well that he was so for the Western Reserve proletariat of the time consisted of sturdy souls who considered themselves as good as the next one and probably a darn sight better. The esteem in which he was held by the workmen was demonstrated upon his return from a trip to Europe in the eighties; the entire force—all one hundred of them—men, women, boys and girls, quit work and went down to the depot to welcome their president. Goodrich invited them to his Middlebury Street home, chased the maid to the cellar for a pitcher of Bourbon and all hands downed a toast. Another example of employer-employee relations when the Akron rubber business was young was the custom which Dr. Goodrich started of giving every workman a turkey or a dollar at Christmas. Frequently the dollar was chosen because of greater worth.

Earnest Democrat and civic spirted citizen also was the rubber company founder. In 1880 he was elected to the city council as the representative of Ward Three. His political career was a brief one but far from quiet. The rubber man and Parke Alexander were nominated for the presidency of the council. Goodrich got six votes and his rival five and so it remained through thirty-five ballots. The mayor finally decided to recognize Goodrich but Alexander would have none of it. The battle raged in the rival daily newspapers; Alexander and his cohorts withdrew from the council; no meetings could be held because of lack of a quorum. City Solicitor Humphrey stuck his nose into the quarrel and was immediately told off by the doctor. "The solicitor is not running this council, and is not going to, I want you to understand that," bel-

lowed the indomitable Goodrich. The others, after several months, yielded and the doctor served the rest of his term in peace.

He had fought tuberculosis for years and in 1888 he visited Dr. Pepper, Philadelphia specialist, who convinced him that he could no longer stay in Ohio. Thereupon, the founding father of the rubber business arranged to retire, went to Manitou Springs, Colorado, and started planning to build a home. The contemplated residence never materialized: on August 3, when alone in his room, he suffered a severe hemorrhage, had just enough strength to pull the bell rope and died before help arrived. Colonel Perkins succeeded him in the presidency of the company.

Building the First Pneumatic Tire

Two important events occurred in the rubber world in 1896. One of them was the building of the first pneumatic tires for an automobile by Goodrich. As Alexander Winton, pioneer auto man, told the story once in reminiscent mood: "I went to the Goodrich company in Akron, and told them I wanted something bigger than their biggest bicycle tire, something that would fit the wheels of a horseless carriage."

"'That's a new one on us', cried the man to whom I had been directed. 'A horseless carriage, eh? Humph! Will it run?'"

"You bet it will!

"'Well, I guess we can make them, although we never have!'

"That's fine.

"The man hesitated, rubbed his chin and observed. 'We will make them, but you will have to pay for the molds.'

"'Do what?'

"'Yes, sir. There won't be enough call for tires for horseless carriages and we can't afford to pay for the molds. Also, you will have to pay for them in advance—and the tires, too. We'll have them on our hands if you don't get them.'

"I paid.

"They were single tube affairs and pretty expensive. It wasn't long before I got a puncture, and while I thought of patching the tire I figured out what I considered a better idea. Molasses was heavy and would stop leaks if they weren't too large, so I began pumping it into the tube. I pumped too hard. The rubber gave way and the molasses came out too quickly to be dodged."

Seiberling's Entrance Into Rubber

In 1896, also, President Perkins, of Goodrich, was able to announce sales of almost two and a half million and profits of nearly four hundred thousand for the preceding year. This led to the year's second important rubber event. If this kind of money was to be made, other Akronites decided this caoutchouc business might be worth looking into. Among them was John F. Seiberling who had contributed to the fund that had brought Dr. Goodrich to town in the first place. Unlike Crouse, Seiberling had taken cash instead of stock in the Goodrich reorganization and had gotten out of rubber. He still kept up an interest in it, however. And when Seiberling's Empire Reaper and Mower Company, after spectacular success, went down in crashing failure as had his earlier Excelsior Mower and Reaper he launched the India Rubber Company. This was soon taken over by the Rubber Goods Manufacturing Company which later became U. S. Rubber and thus ended the senior Seiberling's connection with the industry. In 1898, oldest son Frank brought the family back into the business when he started the Goodyear Tire and Rubber Company in an abandoned woolen mill and an equally abandoned strawboard plant in East Akron.

Early Trials of Goodyear Company

As is generally known in the rubber industry, Charles Goodyear, the great inventor, was in no way connected with this corporation that came into being thirty-eight years after his death. Choice of the name Goodyear was a happy inspiration on the part of young Seiberling. Although the name of Charles Goodyear was not well known to the public at the time, the confusion rising from the similarity to the long-established name "Goodrich" probably resulted in some benefit to the newcomer. Later, the phrase "The Greatest Name in Rubber" would be used with telling effect in an institutional advertising campaign.

Seiberling talked sewer-pipe king David Hill out of $10,000 to start with but weeks of additional canvassing brought his total to only $43,000. During the early years Seiberling sweated to meet payrolls and pay for materials. Occasionally a shipment of rubber arrived C. O. D. and he was forced to scurry around town to raise the cash to lay on the line. Akronites who loaned the young man money for these deals were given a choice of payment in stock or sixty-day notes and almost without exception took the notes. A few years later the thud of the citizenry kicking its collective self could be heard for miles. In a quarter of a century, $10,000 of original Goodyear stock would have amounted to a little less than a million dollars, so swiftly did the genius of Frank Seiberling build Goodyear into the world's largest producer of auto tires.

Creation of the Firestone Dynasty

Of the quartet mentioned in the opening paragraphs there now remains to be considered only the peddler of wild rose lotion. He was Harvey Samuel Firestone, founder of the company that bears his name. Firestone went from his father's Ohio farm to a coal office in Columbus and then into selling the lotion, flavoring extracts, cough syrup, and *Arabian Oil* horse liniment. From this he graduated to buggy selling in Detroit. Young Firestone had the only rubber-tired buggy in the city and when the company for which he was working failed, he decided he could do no better than to go into the buggy tire business. He started in a modest way in Chicago buying his tires in lengths like garden hose, cutting them to size and cementing them to wheels. A merger with another buggy tire outfit followed by outright sale to Consolidated Tire left Firestone with $45,000 in cash. In 1900 he came to Akron and started the Firestone Tire and Rubber Company which for the first two years of its life was a buggy tire jobbing business, the tires being made by other factories. In 1902 Firestone started manufacturing on his own account and eventually built his company up to an important position in the industry.

Goodrich, Goodyear, Firestone—three of the five largest rubber companies in the world. This was the whirlwind of reward reaped by the city as a result of the sowing of a windy pamphlet by a village board of trade in the '60's. The leaflet brought Goodrich, the Goodrich profits attracted Seiberling, and the success of these two caught the eye of Firestone. Together these three took the epochal discovery made by Charles Goodyear in a Woburn kitchen a century ago and built it into one of America's greatest industries.

General Electric's Tire-o-scope

New Fluoroscopic Device Permits All Filling Station Attendants to X-Ray Tires on Automobiles without Removing Tire from Wheel

A NEW fluoroscopic device which permits filling station attendants to x-ray tires on automobiles has been developed by engineers of the General Electric X-Ray Corporation, Chicago, Ill. It is called the "Tire-o-scope." Without removing the tire from the automobile, the operator of the device can by x-ray look into the tire to detect breaks, bruises, cord separations that are otherwise hidden, and such foreign objects as tacks, nails, wire, screws, glass and stones embedded in the casing.

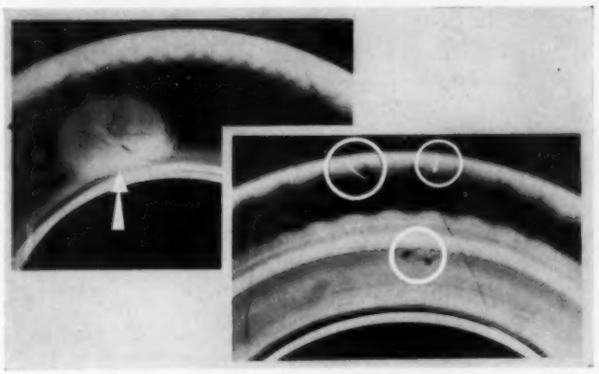
The unit is designed for inspection of tires on all types of passenger cars, except large buses, and on some of the smaller trucks. The x-ray output is such that accurate inspection may be made of tires up to and including an eight-ply white side-wall tire. White side walls contain zinc oxide which renders them more opaque to x-radiation than the ordinary black walls.

Only a single standard electric light outlet is required for operation of the unit which is equipped with rollers for easy movement about a station and from wheel to wheel of the car being inspected. A control device operated by a push button permits the operator to mark on the tire defects observed on the viewing screen as the wheel is turned slowly in the instrument.

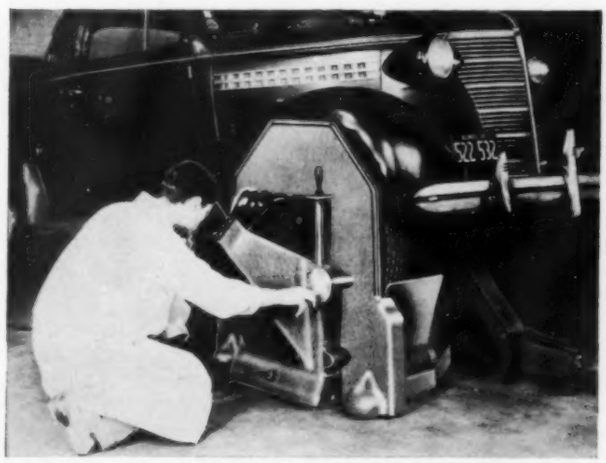
Equipment Absolutely Shockproof

The unit includes an all-metal x-ray head, in which all high voltage parts, including transformers and the x-ray tube, are immersed in oil in a grounded-metal container. This renders the equipment shockproof for the protection of the operator and others who may be in the vicinity of the machine while it is in use. The x-ray generating equipment is of a type long used.

A line switch, governed by a removable key, prevents unauthorized use of the unit. A second x-ray switch, which energizes the x-ray tube only while the button is depressed, prevents unnecessary exposures and prolongs tube life. The control panel also includes a two-position kilovolt selector to permit proper selection of voltage. The higher voltage is required for heavier tires. A pilot light glows red when the unit is ready for use.



Radiographs showing defects in a tire detected by the Tire-o-scope. The arrow points to a stone bruise while circles indicate a nail, sidewall break and a small piece of glass.



The Tire-o-scope in use, with the operator's hand on the manually-operated control of the wheel-turning roller.

To inspect a tire with the device the end of the car involved is jacked up until both wheels are about nine inches above the floor. The Tire-o-scope is rolled under the wheel so that it is centered in line with the axle and as close as possible to the outer wall of the tire without touching it. By turning a control wheel, the unit is next immobilized and, by this single operation, a brake is applied to keep the machine from moving, x-ray protective end-shields are raised into place, and a wheel-turning roller is pushed snugly against the tire. While pressing the x-ray switch button, the operator looks at the tire image through the viewing hood. The tire is rotated by turning a second control wheel until the entire circumference has been inspected.

Defects Can Be Accurately Located

When a defect or foreign object is seen on the fluoroscopic viewing screen, it can be located exactly on the tire by pressing the button operating the marker while the defect is opposite an arrow visible at the center of the screen.

The instrument is the result of more than two years of research and marks the application to automotive safety of much that has been learned about the use of the x-ray in other commercial and medical fields. The designers expect it to increase the tire sale and tire repair business of filling stations and to reduce the number of accidents caused by tire failure.

Program Completed for Rubber Division Meeting

Meeting in Cincinnati on April 11 and 12 Will Feature Ten Papers, Crude Rubber Report, Business Session and Banquet

PRESENTATION of ten technical papers, a report from the Crude Rubber Committee, a business meeting, and the usual banquet are the features of the meeting of the Division of Rubber Chemistry of the American Chemical Society, to be held at the Hotel Gibson in Cincinnati, Ohio, on Thursday and Friday, April 11 and 12.

According to present plans, the technical sessions will be held at the Gibson on Thursday afternoon and Friday morning. The Crude Rubber Committee's report will be made after the presentation of the last technical paper on Friday morning, and will be followed by the business meeting.

The banquet, which is being arranged by a committee headed by V. L. Smithers, will be held on Thursday evening in the main ballroom of the Hotel Gibson. It will be informal. There will be a program of music during the dinner, followed by appropriate entertainment. This entertainment, it is reported by the committee, will be absolutely out of the ordinary and something new insofar as banquets of the Division are concerned.

Abstracts of the papers, together with the names and company connections of the authors, follow herewith.

Program of the
DIVISION OF RUBBER CHEMISTRY
AMERICAN CHEMICAL SOCIETY
Hotel Gibson
Cincinnati, Ohio—April 11-12, 1940

Thursday Afternoon—April 11
Technical Session
Thursday Evening—April 11
Banquet—Gibson Ballroom
Friday Morning—April 12
Technical Session
Report of Crude Rubber Committee
Business Meeting

ABSTRACTS OF PAPERS

Correlation of Nitrogen and Ash with Total Solids Content of Latex. ***J. McGavack and C. E. Rhines (U. S. Rubber Co., Passaic, N. J.).***

Nitrogen and ash determinations have been made on Hevea latices of widely varying total solids content, with the result that both of these values have a constant value on the latex independent of the solids content. These values are approximately 0.25% for the nitrogen and 0.5% for the ash. It is also shown that residual nitrogen directly associated with the rubber is constant value (0.1%) independent of the purification of the latex.

Diffusion of Sulfur in Rubber and Its Relation to Vulcanization. ***A. R. Kemp, F. S. Malm, G. G. Winspear and B. Stiratelli (Bell Telephone Laboratories, New York City).***

The absorption of sulfur by various types of rubber has been determined at temperatures ranging from 25° to 86° C. The absorption technique has been shown to be unsatisfactory to determine the solubility of sulfur in rubber since sulfur in excess of that required for saturation crystallizes within the rubber. The absorption of sulfur by rubber appears to be osmotic in nature since it decreases with increased stiffness of the rubber.

It has been shown that sulfur diffuses into masticated crepe rubber at the rate of 0.0056 cm. per hour at 56°C. The rate of diffusion of sulfur through masticated crepe and vulcanized rubber has been determined by the cell method at temperatures ranging from 58 to 96°C. The rate of sulfur diffusion through ebonite at 86°C. has been found to be practically nil.

The solubility of sulfur in masticated crepe rubber has been determined by milling experiments and the results agree very closely with those given by Ira Williams who used a different method. The rate of solution of sulfur in rubber during milling has also been determined.

Heterogeneous or spotty vulcanization has been found to result from undissolved and non-uniformly dispersed sulfur in the unvulcanized mix. This heterogeneity has been shown to affect adversely the physical characteristics of the vulcanized rubber, resulting in a decrease of its tensile strength to less than 10 per cent of the best value in extreme cases. The effect of variations in mixing technique on heterogeneity, rate of vulcanization, and physical tests has been discussed and the need for further study in this field pointed out.

Hysteresis in the Crystallization of Stretched Vulcanized Rubber from X-Ray Data and the Correlation with Stress Strain Behavior and Resiliency. ***George L. Clark and Ernest Blaker (University of Illinois, Urbana, Ill.) and John M. Ball (R. T. Vanderbilt Co., New York City).***

X-ray diffraction patterns have been made under carefully controlled conditions of tensile strips of vulcanized rubber of known composition and cure, at intervals of 25 per cent elongation up to 500 per cent during elongation and at the same intervals during retraction. The fiber diffraction patterns have been quantitatively measured for intensity with a densitometer; these values plotted against elongation give highly characteristic hysteresis loops which are very sensitive indications of the composition and previous history of the sample. These loops are determined for the initial extension of the original sample and for the tenth cycle of elongation and retraction.

Correlation is established between the x-ray loops, indicative of the establishment and retention of crystallization or ordered arrangement of molecules, and stress-strain diagrams, which show remarkable similarity to the x-ray loops, and the impact resiliency, as a means of giving a fundamental

molecular explanation to the physical and mechanical properties. The presence or absence of 0.25 per cent of a vulcanizing agent is found to have a profound effect upon these parallel effects. The investigation here reported is the first of a series designed to discover the effects of every variable upon inception of molecular orientation and its persistence upon removal of the stretching deformation.

The T-50 Test Applied to Reclaimed Rubber. ***Henry F. Palmer and Robert H. Crossley (Xylos Rubber Co., Akron, Ohio).***

The use of the T-50 test as a means of evaluating reclaimed rubber has been investigated.

Tire and tube reclaims of varying alkalinities were compared in typical tread and inner tube formulas. Variations in curing rates of these compounds caused by the reclaims are shown more distinctly by T-50 tests than by tensile and modulus tests.

The introduction of successive increments of reclaimed rubber into a tread compound was accompanied by a progressive reduction in T-50 values during the early cures, although the ultimate values attained were the same.

T-50 values are shown to be more uniform than tensile strength values on the reclaim-sulfur mix. Variations in curing rates of reclaims may be interpreted by means of T-50 tests on the reclaim-sulfur mix, but such tests are not as informative as tests on type compounds in which the reclaims are used.

Dielectric Properties of Plasticized Polyvinyl Chloride. ***J. M. Davies and W. F. Busse (B. F. Goodrich Co., Akron, Ohio).***

The dielectric properties of plasticized gamma polyvinyl chloride are of interest not only because this material is of great practical importance as a flame-proof, oil-resistant, electrical insulation, but because it may throw light on the mechanism of dielectric loss in certain types of solid insulating materials.

New data are presented for the power factor and dielectric constant at 15, 60, and 1,000 cycles of stabilized polyvinyl chloride-tricresyl phosphate mixtures varying from 0 to 60% plasticizer over the temperature range from —20° to +120° C. The results are consistent with Fuoss' suggestion that the loss is due to two or more factors—an ionic conductance and a dipole rotation.

The ionic conductance increases continuously with temperature, but the dipole rotation produces a maximum in the curve for power factor versus temperature for each sample. The temperature of this maximum varies from 98° to 2° C. for this range of plasticizer content.

At room temperature these samples ranged from a hard, horny material to a soft, elastic material. However, at the temperature of the power factor peak, the mechanical properties were remarkably similar. The following table shows the durometer hardness at the temperatures of the 60 cycle power factor maxima for different stocks:

Plasticizer, %	0	10	20	30	40	50	60
Temperature of P.F. peak, °C.	95	77	61	43	27	11	—2
Durometer hardness	95	96	96	95	93	89	81

The small difference in durometer hardness of these compounds at the temperatures of the power factor peaks suggests very strongly that the mechanism which hinders dipole rotations is very similar to the mechanism that hinders small macroscopic elastic deformations. The effect of adding plasticizer is roughly equivalent to raising the temperature, so it is probable that both the rotation of the active C-Cl dipoles, and the slipping of $(CH_2CHCl—)_n$ chains past each other is hindered by the secondary valence forces around the Cl atoms. The activation energy for small deformations should then be related to the energy barriers hindering dipole rotations.

The power loss due to ionic conductance can be greatly reduced by adding stabilizers, but they have little effect on the peak due to dipole rotations. By the suitable choice of plasticizer and stabilizer, compounds can be made whose power factor decreases continuously from room temperature up to 80° or 100° C.

X-Ray Examination of Polyisobutene. ***C. S. Fuller, C. J. Frosch and N. R. Pape (Bell Telephone Laboratories, Summit, N. J.).***

Complete measurements of the fiber pattern of stretched polyisobutene have been made and the identity period along the fiber axis has been found to be 18.63 ± 0.05 Å., a value which is in close agreement with that previously published by Brill and Halle. It has been determined by means of patterns obtained from samples inclined at various angles to the x-ray beam that only the even orders of the fiber period occur and that the eighth order is the most intense. These facts furnish support for a 1:3, *i.e.*, a head-to-tail structure for polyisobutene and indicate that eight isobutene units are contained in the fiber period. This information together with the fact that a shortening of 1.6 Å. from the planar zigzag form occurs suggests that the chain configuration is that of a helix in which the methyl group pairs situated on the alternate chain carbon atoms complete one revolution about the chain molecule in the fiber period distance.

On the basis of the symmetry provided by the above chain configuration, it is shown that the orthorhombic cell a = 6.94 Å., b = 11.96 Å., c = 18.63 Å. (fiber axis), and the space group $D^4_2 — P_{\substack{2\,2\,2\\1\,1\,1}}$ are in agreement with all of the x-ray data. The cell is pseudohexagonal. 1.9 repeating units per unit cell result on the basis of a density of 0.91 for stretched polyisobutene.

The X-Ray Structure of Rubber-Carbon Black Mixtures. ***S. D. Gehman and J. E. Field (Goodyear Tire & Rubber Co., Akron, Ohio).***

The effects on the x-ray structure of stretched rubber caused by the incorporation, in varying quantities, of carbon blacks of different average particle sizes were investigated.

The minimum elongation necessary for the fiber diagram to appear was determined by photometric measurements of the patterns for a range of elongations. For the same black, this minimum elongation decreased as the loading increased. For the different blacks, the minimum elongations were in the same order as the average particle sizes of the blacks, the loading being the same.

The results were interpreted as making evident the existence of a region of enhanced stress in the vicinity of the particles. This field of stress was also apparent from the increased length of the diffraction spots, an effect which was found to depend upon the particle size of the black.

The bearing of the x-ray results on various theories which have been advanced in regard to reinforcement by carbon black is discussed as is the possible relationship of the observed x-ray structure to the general physical effects of reinforcement. It is concluded that the x-ray data can be explained on the basis of the known stresses in the vicinity of large inclusions in stretched rubber. The field of stress shown by the x-ray patterns to exist about the particles implies that the rubber molecules are firmly attached to the surface and that the rubber works at a higher point on its stress-strain curve. The reduction in plasticity which might reasonably be expected due to the immobilized molecules appears sufficient to account for the rest of the results.

Dilatometer Studies of Pigment-Rubber Systems. ***H. C. Jones and H. A. Yiengst (New Jersey Zinc Co., Palmerton, Penna.).***

In dilatometer measurements a gum stock decreases in volume, and certain pigmented stocks increase in volume when stretched. Volume decrease is attributable to fibering or orientation of the rubber molecules and the increase in volume of pigmented stocks to the formation of vacuoles at the pigment-rubber interfaces.

State of cure had a marked effect on dilatometer results. An undercured gum stock exhibited a greater volume decrease and the decrease occurred more readily than with an optimum cure. In highly pigmented stocks the long cures showed a greater volume increase than the short cures.

Zinc oxide was the pigment employed in this study and it was noted that particle size and pigment loading influenced the volume increase on stretching; the larger the particle size the greater the volume increase. For a given zinc oxide, the volume change increased with increments of zinc oxide.

The Effect of Hydrogen Sulfide on the Rate of Vulcanization of Rubber Compounds. ***E. W. Booth and D. J. Beaver (Monsanto Chemical Co., Nitro, West Virginia).***

It was found that rubber dissolved 1 per cent of hydrogen sulfide at room temperature. This amount of gas is sufficient to retard the rate of vulcanization of all types of accelerators. However, the physical properties of the hydrogen sulfide treated compounds containing aldehyde-amines, dithiocarbamates, thiuram sulfides, and litharge were poorer no matter how long the time of vulcanization was increased, while similarly treated compounds containing the mercaptobenzothiazole type and diphenyl guanidine accelerators produced physical properties equal to the untreated compounds on prolonging the time of vulcanization. There was little or no evidence of the formation of zinc sulfide or of the reaction of sulfur with hydrogen sulfide.

Machine and Methods for Testing Mechanical Stability of Latex. ***Charles K. Novotny and Wilbur F. Jordan (Firestone Tire & Rubber Co., Akro, Ohio).***

Methods and machines have been studied for making mechanical stability tests on latices. The results indicate that a constant-speed machine and fixed solids in test samples give reproducible results at widely separated laboratories.

Preservation of Brain Specimens

NEW technique for the preservation of brain specimens for demonstration and classroom use, or during transportation by airmail, express or in personal luggage, has been developed by Dr. L. Wallingford Darrah, of Northampton State Hospital, Northampton, Mass. The new process, involving the use of Pliofilm, was recently exhibited by Dr. Darrah in the Neurological unit of Boston City Hospital.

Because brain specimens ordinarily are preserved in formalin or some similar solution, transportation of specimens usually involves the use of glass, stoneware, or other heavy containers. Dr. Darrah, who has frequent occasion to lecture on neuropathology and related subjects, always on the alert for some way to simplify the task of carrying his brain specimens, decided to make his own containers of Pliofilm.

Dr. Darrah has experimented with several methods of making his envelope-like containers. One method is to take a sheet of Pliofilm of desired size which is folded double. The two outer sides are than heat sealed with a small iron designed for the purpose. This results in an envelope, the bottom of which is the fold of the Pliofilm sheet and the two sides the heat sealed edges. The top is open and the brain specimen is inserted, after which the top also is heat sealed, completing the job.

Brain specimens should be in a 10 per cent formalin solution for at least two months prior to their preparation as described above. After the formalin treatment they may be lifted directly from the solution into a Pliofilm envelope and sealed as is, if care is exercised to be sure edges being sealed are perfectly dry. The surplus solution will not damage the container. If more desirable, brain specimens may be rinsed in cold water, dryed lightly with a towel, then sealed.

Another practical method of making Pliofilm containers Dr. Darrah has employed for his specimens involves the following steps: A single sheet of Pliofilm is doubled, as in the other method described, but only the top (that portion opposite the fold) is heat sealed. This results in an oblong sack, open at both ends. The specimen is inserted and both ends then are twisted up tightly and the twists heat sealed. This method results in a form-fitting container that is neater in appearance than the loose envelope type accomplished by the first described envelope method.

Controlling Dust in Rubber Factories

(Continued from page 364)

partment, he states, control of dust is necessary in the filling of pigment bins and in the weighing of the many stock batches. Next, the loading hoppers of all Banbury mixers, as well as the necessary hoods over mixing mills, must be connected to suitable exhaust systems.

Continuing, he stresses the point that exhaust systems are essential in various departments such as rubber floor tiling, abrasive wheels, brake linings, clutch facings, and various sundries, in all of which grinding is required, both to secure precision of size and proper finished surface, from the standpoint of health and cleanliness.

In addition, he feels, it is also necessary to operate a large fleet of portable vacuum cleaners, constantly removing any deposit of dust on ceilings, walls, pipes and floors. No modern mechanical rubber factory could function without these aids and safeguards, he concludes.

These conclusions are concurred with by the safety supervisor of a large rubber company operating a number of factories. Wherever grinding operations, such as on steering wheels, hard rubber goods, rubber-covered rolls and buffing operations are concerned, the wheels are always partly enclosed and the dust is carried outside the building. Sufficient exhaust is provided as near the point of operation as possible, in keeping with good dust control provisions. This company has not had a claim under the Workmen's Compensation Law by any employee as a result of exposure to rubber dust for many years.

The one hazard that rubber dust does present, this safety executive reports, especially in some operations, is the fire hazard. This hazard is of course generally known throughout the rubber industry and when the exhaust system is properly installed and cleaned out periodically the hazard is reduced to a minimum.

Latac—Latex Accelerator

THE newest accelerator for latex compounds added to the line of rubber chemicals and compounding ingredients marketed by the Rubber Chemicals Division of E. I. du Pont de Nemours & Co., Inc., Wilmington, Delaware, is Latac. Chemically, Latac is hexa-methylene ammonium hexa-methylene-dithiocarbamate. It is a water soluble dry powder and is stable in storage. According to DuPont, latex compounds containing the new accelerator vulcanize rapidly at all temperatures and have excellent age resistance. This resistance is increased when Latac is used in combination with Zenite. Stocks accelerated with the new latex accelerator are also found to have high modulus.

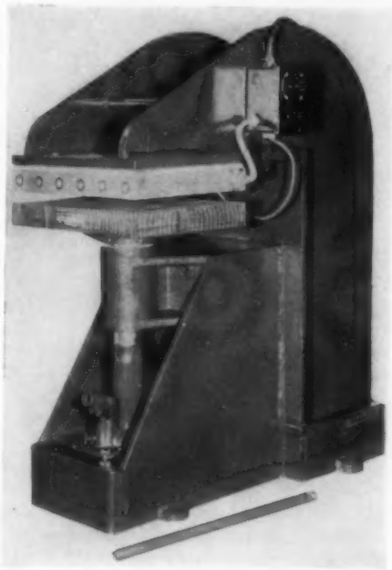
Kalvan

A NEW calcium carbonate pigment of extremely fine particle size, which is said to give unusually high tear resistance to white or brightly colored rubber stocks, has been introduced by the R. T. Vanderbilt Co., 230 Park Avenue, New York City, under the tradename of Kalvan. Stocks containing this new pigment, which has a particle size of 1/10 micron, are said to have five times greater tear resistance and fifty per cent higher tensile strength than stocks containing ordinary whiting. Stocks containing Kalvan are also said to exhibit unusual resistance to flex-cracking.

New Equipment

Howe Branding Press

A NEW machine for applying trade-marks, brands and other insignia to flat belting has been developed by the Howe Machinery Co., Inc., 30 Gregory Avenue, Passaic, N. J. It is a rugged press, compact, light in weight, equipped with a hand pump which provides hydraulic pressure up to 10,000 pounds. The



platens, measuring 12 x 16 inches in size, are electrically heated with cartridge type heating elements. The heating elements are connected to a thermostatic control for regulating temperatures up to 500° F. A large "throat" provides for the branding of flat belts up to 25 inches in width. According to Howe engineers, the press can be quickly changed into one suitable for branding V-belts by simply removing the lower platen and replacing it with a V-grooved platen. The press comes completely ready for operation once it is plugged into any ordinary lighting circuit. The frame of the press is of welded steel plate, the lower platen is of cast iron, the upper platen is of aluminum, while transite board is used for insulation.

Improved Stabilflo Valves

AN improved line of Stabilflo controlled valves designed for accurate response to the demands of a control instrument has been announced by the Foxboro Co., Foxboro, Mass. Equipped with wide range V-port plungers, the valves have a rangeability of 50 to 1. When lifted off the seats the initial clearance flow is 2%. From this 2% flow to 100% flow, the valves give equal percentage increases in flow for equal amounts of valve lift. The V-port plunger is screwed and pinned to the valve stem and designed for easy field reversal. In addition to this plunger, a parabolic plug type and a wide radio turned plug type are also available for exceptional control applications.

G.E. Plugging Switch

IN a new plugging switch for controlling motor stopping, recently introduced by the General Electric Company, the use of an Alnico magnet as its fundamental part eliminates frictional parts or clutches and contributes to low maintenance costs and long operating life. Compact design, low operating torque, and immunity to heat are other features of this switch.

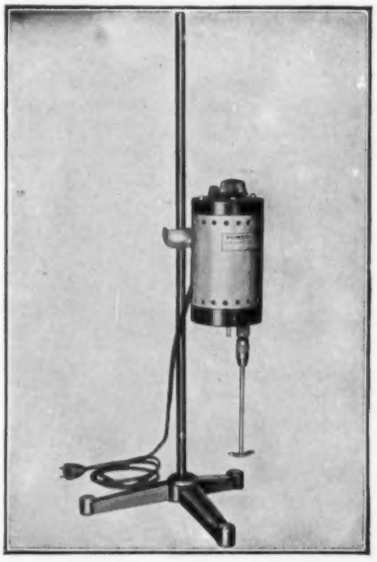
In stopping a motor it is often desirable to reverse the power connection and so bring the motor to rest quickly by its tendency to run in the reverse direction. This is plugging. However, if the motor is to stop, it is necessary that the plugging power be removed at the correct moment, to keep the motor from re-accelerating in the reverse direction. This is accomplished by a plugging switch.

In the operation of this new switch, a driven Alnico rotor produces a rotating magnetic field which induces eddy currents in the walls of the aluminum cup. The magnetic reaction produced by the eddy currents turns the cup through its limited rotation, and the contacts are operated by the Textolite rod which connects the cup and the movable contact strip.

Centering springs tend to keep the contacts in the normal position but since the magnetic operating force on the aluminum cup is dependent on speed, contacts operate at and above a definite speed. As the speed decreases, a definite point will be reached where the spring force will overcome the magnetic force. This is the tripping point. Changing the spring tension provides a simple means of adjusting the tripping speed over a definite range. A different tripping range can be obtained by changing the springs.

New Power-Mix Unit

LABORATORY workers will be interested in a new and improved mixing unit sold by the Chemical Publishing Co., Inc., 148 Lafayette St., New York City, under the trade name of "Power-Mix". The new unit



is supplied with a Monel support arm which fits into any clamp and allows the mixer to be adjusted at any angle desired. The extra power of the new mixer, made possible by special gearing, enables it to run continuously on heavy fluids, such as latex, lacquers, paints, etc., according to the manufacturer. Full power is said

to be developed at even the lowest speeds. Speed may be varied from 0 to 1350 r.p.m. Features of the new mixing unit include the fact that it cannot be injured by overloading, it is explosion-proof when used with hazardous liquids, it requires no lubrication, and it will run 24 hours continuously without damage. Two shafts, one for high and one for low speeds, are provided. The chuck is adjustable so as to take glass or metal stirring shafts.

Paragon Automatic Reset Timers

AN almost unlimited number and variety of difficult industrial operations can be precisely and economically controlled, including the operation of rubber vulcanizers, batch mixers, etc., by a new series of automatic reset timers and time delay relays just introduced by the Paragon Electric Company, 37 West Van Buren Street, Chicago, Ill. These instruments may be used to close and then reopen a circuit, to open and then reclose a circuit, to make a momentary contact, to repeat a pre-set schedule of momentary contacts or timed

"on" and "off" operations, or to reset instantaneously after a power failure. The new timers are furnished with eight terminals. A positive mechanical lock, magnetically operated, eliminates all friction and magnetic clutches, and frees the timer of any disconnect due to vibration.

Coconut Water as a Coagulant

THE threatened shortage of formic and acetic acids has led to experiments with several substitutes as coagulants for rubber in the Far East. The use of both formic and acetic acids are now under Government control. One of the substitutes tried with fair results is coconut water. According to a circular on the subject recently issued by the Rubber Research Institute of Malaya, milk from at least 25 coconuts should be strained and left to ferment in a covered vessel for not less than five days. Thereafter, the milk, or water, is ready for use but should be carefully strained before use. For every gallon of diluted latex containing one and one-half pounds of dry rubber, 15 fluid ounces of fermented coconut milk are required. The coagulum is ready for rolling the following morning and the rolled sheet should preferably be soaked in fresh water for a short while before drying, according to the circular.

Booklets, Catalogs, etc.

Rubber Latex Compounding. (Report No. 40-1). By Benton Dales and William H. Ayscue. Rubber Chemicals Division, E. I. du Pont de Nemours & Co., Inc., Wilmington, Delaware. 6¼ x 9¼ in. 56 pp.

Through the brief discussion of the history and general properties of latex, effects of compounding ingredients, and outstanding latex applications, this laboratory report provides an excellent working background of pertinent information for the user or prospective user of latex. The sources, composition, preparation and general compounding of latex are dealt with, as are the preparation of compounding ingredients, latex compositions and test films. One section is devoted to accelerators, protective chemicals, stabilizers, thickeners and other compounding ingredients. Another section, one of the most complete in the report, deals with the various processes used in the manufacture of latex products, including dipping, molding, electrodeposition and impregnating and coating. Formulas for the production of toy balloons, gloves, thread, adhesives, and other articles are given. A complete subject index is a valuable part of the report.

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Packaging Catalog—1940. Edited by A. Q. Maisel. Published by Breskin Publishing Corporation, 122 East 42nd St., New York City. 8½ x 11½ in. 538 pp. $2.50.

Under thirteen separate sectional classifications every phase and aspect of packaging is covered in non-technical language in the latest edition of this annual catalog which has earned the title of the "encyclopedia of the packaging industries." The classifications include design principles, paper boxes, bags, metal containers, labels, plastics, displays, and machinery and supplies. Newly introduced in this edition is a division of the design section devoted to packagers and the law, particularly important at this time as a guide for compliance with both Federal and state regulations concerning packaging. In addition to many basic charts and diagrams, over 400 illustrations have been used to stress pertinent points made in the text.

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Rubber as Anti-Vibration Material. By C. W. Kosten. Rubber Foundation of Holland, 182 Heerengracht, Amsterdam, Holland. 6¼ x 9½ in. 16 pp. (A limited number of copies are available without cost from THE RUBBER AGE).

In an attempt to give architects, builders, contractors and others unfamiliar with the characteristics and advantages of rubber as a vibration dampening material, the Rubber Foundation recently launched a basic research into the vibration characteristics of rubber. The results of this research are contained in this communication which first appeared in a recent issue of *De Ingenieur*. The elastic behavior of rubber, the planning of a rubber foundation, and advantages of rubber in comparison with other materials are discussed. A few special cases of insulation also receive consideration.

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Employment Regularization. National Association of Manufacturers, 14 West 49th St., New York City. 6 x 9 in. 96 pp. 15c per copy.

Thirty-five tested procedures for stabilizing employment in industry, successfully utilized in the four broad fields of production, distribution, personnel and management activity, are analyzed in this booklet, based on a survey made by the N.A.M. For the guidance of manufacturers, the booklet contains a compilation of 68 case histories of individual companies, including several rubber companies, which present in detail practical experiences with employment stabilization and the degree of success accomplished. The survey made was the most comprehensive yet undertaken in this important field.

Bijdrage Tot De Kennis Van Het Oproomingsproces. (Contribution to the Knowledge of the Creaming Process). By G. E. van Gils. Published by the West Java Proefstation, Buitenzorg, West Java, N.E.I. 7¼ x 10½ in. 42 pp.

Printed in Dutch, with a three-page summary in English, this booklet, which contains a reprint of an article from a recent issue of *Archief voor de Rubber-cultuur,* discusses several pertinent points with respect to the creaming of latex. The formation of agglomerates, the mechanism of cluster formation, the influence of the concentration of the creaming agent on the dry rubber content of cream and serum, and the influence of electrolytes on the same content are some of the subjects discussed. A number of charts, diagrams and illustrations are used. In all cases English translations are given.

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El-Sixty—An Accelerator for Rubber Vulcanization. Rubber Service Department, Monsanto Chemical Co., Second National Bldg., Akron, Ohio. 9 x 12 in. 20 pp.

This booklet describes the fundamental behavior of El-Sixty, which was originally developed as an accelerator to economically aid the vulcanization of rubber compounds containing large amounts of clay but which has now been determined to have properties which extend its use to practically all lines of rubber manufacture, and demonstrates its use in several typical applications. The effect of various activators in different stocks on El-Sixty is indicated by charts in the first part of the booklet, while the balance of the booklet is devoted to formulas containing the relatively new accelerator. Test results are included.

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R.M.A. Manual of Retreading and Recapping. Published by the Rubber Manufacturers Association, Inc., 444 Madison Avenue, New York City. 8½ x 11 in. 14 pp. 10c per copy.

In the past, information regarding retreading was included in the R.M.A.'s "Manual of Tire Repairing." Because of the present importance of retreading and recapping, however, it has been deemed desirable to publish a separate manual on the subject, confining the text of the first-named manual to information on sectional repairing. The new manual gives recommended processes for retreading, recapping and top-capping, and discusses such pertinent factors as inspection, preparation, die size selection, building-up, curing and finishing.

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Goodrich Products—1940. B. F. Goodrich Co., Akron, Ohio. 8½ x 11 in. 16 pp.

This booklet briefly describes some of Goodrich's products and the fields of service in which the company specializes. Like previous editions, most of the products are illustrated, with stress laid upon those developed in recent years. This edition, for instance, makes mention of the company's road expansion joints, various applications of Koroseal, products made of Air-Cell and improvements in drug sundry items, particularly gloves and tubing.

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Recording Thermometers. (Bulletin 198-2). Foxboro Co., Foxboro, Mass. 8½x11 in. 40 pp.

This bulletin describes the complete line of recording thermometers made by the company for every industrial use. It is illustrated with 70-odd photographs of thermometers, their parts and accessories, and gives installation details. Advantages of certain methods of installation are discussed. Principles and construction of the new Monotherm system are also explained.

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Rex-Bellows Tubing. (Bulletin SS-16). Chicago Metal Hose Corporation, Maywood, Ill. 8½x11 in. 4 pp.

Both divided and fully corrugated forms of the new Rex-Bellows stainless steel flexible units, together with couplings and pressure and vacuum tight joint secured by a process of electric resistance circumference seam welding, which eliminates soldering and brazing, are shown in this bulletin. Sizes and specifications are included, as well as pressure data.

Stokes Completely Automatic Molding Machines. (Catalog No. 906). F. J. Stokes Machine Co., Tabor Road, Philadelphia, Penna. 8½ x 11 in. 16 pp.

In addition to illustrating and describing the various automatic molding machines for plastics manufactured by Stokes, this catalog discusses the advantages of automatic molding over other methods, with regard to molding time, labor, material, finishing, etc., and describes the various molding operations. Some interesting data on production costs is contained in a section devoted to "case histories."

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Metcolizing. Metallizing Engineering Co., Inc., 21-07 Forty-First Ave., Long Island City, N. Y. 8½ x 11 in. 8 pp.

Metcolizing is the application of a coating of a special aluminum on metals exposed to heat. This bulletin describes the process in detail and discusses several typical metcolizing jobs. A list of the equipment which lends itself to this process and the advantages of the process itself are given.

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Smash Hits of the Year. Travelers Insurance Co., Hartfort, Conn. 6 x 9 in. 36 pp.

This booklet, the tenth annual safety edition to be issued by the company, records pictorially and graphically the facts about accidents in which 32,100 persons were killed and almost 1,250,000 others were injured last year. Special features include statistics and editorials on various phases of traffic safety.

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Schrader Dealer Catalog. (No. 45). A. Schrader's Son, 470 Vanderbilt Avenue, Brooklyn, N. Y. 8½ x 10¾ in. 32 pp.

New and greatly enlarged, this latest Schrader catalog illustrates and describes the varied line of accessory equipment manufactured by the company. Prices are clearly stated on each item. In addition, the catalog lists numerous deals offered by Schrader to the automobile dealer.

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THE New Farval. Farval Corporation, 3261 East 80th St., Cleveland, Ohio. 8½x11 in. 4 pp.

Advantages of the Farval multiple measuring valve, said to provide positive lubrication for small machines, are stressed in this folder. The valve, which can also be used to lubricate a few bearings on larger machines, is described in detail with schematic drawings used to illustrate its rugged construction and operating mechanism.

Book Reviews

Sulphated Oils and Allied Products. By Donald Burton and George F. Robertshaw. Published by Chemical Publishing Co., Inc., 148 Lafayette St., New York City. 5½ x 8½ in. 172 pp. $5.00.

The chemistry, literature and analysis of sulphated oils and allied products are adequately covered in this monograph. In each case, the analysis of sulphated fatty products is preceded by a brief general outline of the various classes of compounds of this nature, of their production, and of what is known as to their chemical constitution. Subsequently, the authors discuss each proposed method for the determination of each of the various analytical characteristics critically and point out where existing technique must be considered faulty. In view of the fact that our knowledge of the mechanism of the "sulphonation" process and of the products presented in "sulphated" oils or fatty acids is so very incomplete, this monograph serves a most constructive purpose.

Editorial Comment

Victory for Tire Makers

THE action of Judge Edward A. Conger of the United States District Court for the Southern District of New York in dismissing the civil action brought by the Department of Justice under the Sherman Anti-Trust Act to recover triple damages from eighteen tire manufacturers for submitting identical bids on tires and tubes to governmental departments has far-reaching implications to manufacturers of all kinds bidding for government contracts. The suit, the first of its kind ever filed by the government, was admittedly a test case to determine whether the government could collect triple damages under the terms of the Sherman Act.

The background of the suit is this: Eighteen tire manufacturers submitted bids to the government procurement division back in 1937 on tire and tube requirements for the Navy Department. All 18 bids were identical and rejected on that ground. New bids were requested, and again all were identical. These bids, too, were rejected and the government negotiated and completed a contract with Sears, Roebuck & Company on the tires and tubes then desired.

In an apparent effort to chastise the 18 tire manufacturers involved, the Department of Justice was instructed to bring suit under Section 7 of the Sherman Anti-Trust Act which provides that "any person who shall be injured in his business or property by reason of anything forbidden by this act may sue therefor and recover three-fold the damages thus sustained." The government claimed to have been injured to the extent of $351,158 and accordingly sought to recover $1,053,474.

In their defense, the tire companies advanced the argument, never before put forth in such an instance, that the government had no legal power to sue for triple damages because it was not a "person" under the terms of the Sherman Act. The motion was argued last April and on February 5 Judge Conger filed an opinion sustaining the contention of the manufacturers. Therefore, the suit was dismissed on a technical point. In announcing his opinion, however, Judge Conger stressed the point that the government had every right to prosecute the defendants under the criminal portions of the Sherman Act.

No matter what the next phase of the case may be, the action once more puts the spotlight on the unfairness of the present system of bidding on government contracts. For instance, winning on a bid is no assurance that the winner will receive the government's order; it is simply an authorization of eligibility. If the company awarded the order cannot make prompt delivery due to low inventories or other causes, the government goes into the open market and the company awarded the original bid is charged with the difference between its bid and what the government pays. And, in the case of tires, bid requests never state the quantity of tires desired, but are made on cost per size only. Thus, the winner of a tire bid never knows whether he will be required to supply 100 or 1000 tires.

In light of these circumstances it would appear that the present system of bidding on government contracts is uneconomic, not to say unfair. Great good would eventuate if the dismissal of the government's suit against the 18 tire manufacturers for submitting identical bids would lead to a thorough overhauling of the government's tire bidding system.

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High-Yielding Rubber Trees

RECENT newspaper reports, emanating from Costa Rica, have expressed confidence in the belief that the United States has fair prospects of becoming independent of Far Eastern rubber sources "if the present efforts of American rubber companies to grow rubber in Latin America prove successful." The optimistic viewpoint was based on some statements made by W. E. Klippert, manager of the Goodyear plantations in Central America.

While the known facts overshadow the optimism expressed, still some of the statements attributed to Mr. Klippert merit attention. For instance, the Goodyear plantation executive stated that in his belief the wage differential between the Far East and Central America is overcome insofar as the cultivation of crude rubber is concerned by the planting of higher-yielding rubber trees. Some areas under cultivation in Central America, he said, will yield 4,000 pounds of rubber as compared with 700 pounds of rubber from the same area in the Far East. Interesting, if true.

CURRENT • NEWS of the Rubber Industry

MARCH, 1940

U. S. LOSES SUIT ON TIRE COMPANY BIDS

The suit brought by the Government of the United States against eighteen tire manufacturers, filed on February 20, 1939, by the Department of Justice, charging collusion on tire bids made by the defendants to Bureau of Reclamation and the Navy Department, was dismissed by Federal Judge Edward A. Conger of the United States District Court in New York City on March 5.

The suit, which sought triple damages amounting to $1,053,474, was filed under the Sherman Anti-Trust Act. Judge Conger held in his decision that the government is not a "person." He pointed out, however, that the government had recourse under the law to injunction or criminal proceedings.

Setting a precedent in that it was the first legal action in which the United States Government sought triple damages from a group of concerns, the suit was brought under Section 7 of the Sherman Anti-Trust Act which has been in force since 1890. Federal actions in the past based on the Act were always brought under other sections which provide for injunction and criminal prosecutions.

Suit Based on "Person" Theory

In construing the law, Judge Conger referred to the congressional debates preceding its passage. From these and other considerations he decided that the failure of the legislation specifically to mention the government, in naming those authorized to seek damages, was not accidental.

The suit had been based on the theory that the government, in its capacity of purchaser of commodities, was a "person." Judge Conger found, however, that the definition of "person," as the word is used in the Sherman law, does not include the government. In other sections of the law the United States is authorized to take action.

The damages asked were claimed to be due because of excessively high prices that the Federal Procurement Division was obliged to pay for rubber tires in 1937 and 1938. All the defendant companies submitted identical quotations on eighty-two different types of tires on three different occasions, it was alleged. The amount asked by the government was arrived at by figuring the difference between these prices and the prices submitted when competitive bids were made late in 1938.

Contending that a conspiracy had existed among the bidders when the first three purchases were made, the government contended it should have made all the purchases at the same low prices that were obtained on the final occasion. It was alleged the overcharges on the first three occasions were $98,997.57, $127,160.64 and $125,000, respectively. Three times this amount, or $1,053,474.63, was asked.

The question of whether the government will appeal Judge Conger's decision is a problem of the Solicitor General of the United States, it was pointed out. Charles W. Dunn, who defended Goodrich in the suit, commenting on the likelihood of an appeal, said that a final decision in favor of the government would directly concern all manufacturers who have sold to the government "at uniform prices."

The suit was titled United States of America *vs.* Cooper Corporation et al in the court records. The tire manufacturers named were: Cooper, Dayton, Dunlop, Falls, Firestone, Fisk, General, Goodrich, Goodyear, Kelly-Springfield, Lee, Mohawk, Norwalk, Pennsylvania, Schenuit, Seiberling, U. S. Rubber and the U. S. Tire Dealers Corporation.

Winter Travel Increasing

Winter automobile travel is increasing 11% faster than warm weather driving, and there are many indications that American motorists will soon be using their cars as much in winter as in the summer, according to a survey of motoring developments by the B. F. Goodrich Co., Akron. These trends were attributed to the hard-surfacing of 85% of the nation's highways and the scientific advances in safety tire building during the past decade. The survey was based chiefly on monthly consumption of gasoline during the past 10 years.

Select Contest Judges

Three judges have been selected to judge the papers submitted in the 1940 Technical Paper Contest sponsored by the New York Group, Rubber Division, A.C.S. The judges are: Harry Fisher of the U. S. Industrial Alcohol Co., formerly with U. S. Rubber; Emil Schwarz of the General Electric Company; and H. F. Wakefield of the Bakelite Corp.

3 AMERICAN PLANTS FOR SOUTH AMERICA

Three American manufacturers will construct tire factories in South America within the next few months. U. S. Rubber will build a plant in Buenos Aires, Argentina, part of which will be devoted to footwear production; Goodrich will put up a plant in Chile, probably near Santiago; and General Tire will erect a factory in Venezuela, in Chacao, a suburb of Caracas, the Venezuelan capital.

U. S. Rubber is reported to have decided upon an Argentine plant for the two-fold purpose of obtaining additional business and combatting the high Argentine tariffs which have adversely affected exports to that country. Fred S. Carpenter, factory manager of the company's Los Angeles plant, will be in charge of construction activities, while Chauncey S. Garland, industrial engineer in the footwear plant at Naugatuck, Conn., will head the footwear division. It is hoped to get production under way by next October.

50,000 Tire Unit Capacity

Permission to erect a Goodrich factory in Chile was recently secured from Finance Minister Roberto Waccholtz through the British firm of Duncan Fox & Company. Disclosure of the project followed reports that "an important financial group from the United States" was planning to construct a Chilean factory that would produce 50,000 tires a year. The maximum potential market in Chile is estimated at from 150,000 to 200,000 tires a year.

Construction of a plant in Venezuela by General Tire was reported in our previous issue. Further details made available reveal that the plant will be operated by the Compania Anonima Nacional Manufacturera de Caucho y Neumaticos General, capitalized at 1,725,000 bolivars. It, too, will have a capacity of approximately 50,000 units per year. Dr. Alfredo Machado Hernandez heads the new company, while Joseph A. Andreoli, vice-president and general manager of the General Tire & Rubber Export Company, will represent the American company's interest as a member of the board of directors. Mr. Andreoli aided in the formation of the new company.

Special concessions have been obtained from the Venezuelan government in the way of appreciable reductions in duty on raw materials which are to be shipped, for the time being, from the United States.

SIR HENRY WICKHAM CLEARED AS SMUGGLER

The February, 1939, issue of the *National Geographic Magazine* carries an article, profusely illustrated, by J. R. Hildebrand, an associate editor, under the title of "Our Most Versatile Vegetable Product." The article, which discusses rubber from cultivation to production of finished goods, also traces the early history of the material. In the historical version reference is made to the fact that Sir Henry Wickham did not smuggle Hevea rubber seeds out of Brazil, as legend has always had it, but that he took the seeds out of that country with permission of the government.

The authority for this statement in the article referred to has now come to light. It seems that Mr. Huuebrand approached the Leather and Rubber Division of the Bureau of Foreign & Domestic Commerce, Washington, D. C., for information on Sir Henry. To keep the records straight, the Division wrote the office of the American Commercial Attache at Rio de Janeiro for a report on the circumstances attending the shipment in 1876 of Hevea seeds from Brazil to England. The reply from the Attache's office included a memorandum in Portuguese dated June 7, 1939, from the Commercial Museum, at Belem, entitled "Exportation of Hevea Rubber Seeds to the Far East." The following is quoted from a translation of this memorandum:

Quotation from Memorandum

"Since, in the period of these first experimentations, no one was thinking of the possibility of acclimating Hevea in other regions for the purpose of later competing with the rubber from the Amazon, no law existed prohibiting, in Brazil, the exportation of the seeds of this valuable plant, and likewise no one preserved here any reliable account of the circumstances connected therewith. This is the reason why when later it began to be understood that damage would result to the Amazon by the cultivation of Hevea in Malaya, a history of the exportation of the first seeds appeared in many different versions, getting further each time from the simple truth.

"In this way there grew up little by little a legend in which Sir Henry A. Wickham was pictured as a common adventurer who audaciously and surreptitiously stole seeds of the rubber tree, carrying them hidden in a fantasy ship after having lessened the zeal of the high officials of the customs of Belem (Para) by a banquet which he gave on board at the time of sailing. At least this is how it was published in the Journal of Belem on April 20, 1938, where the writer claimed to quote a certain Anton Zischka in his book 'The Secret War for Cotton.'

"The truth is that Henry A. Wickham transported the boxes of seed after despatching them as he would any other merchandise. Inasmuch as there was no illegality in this—and the best proof of this is the fact that there were shipped in this same period many hundreds of young stalks of Hevea that there were no means of hiding when they were carried on board. Perhaps there might be a means of finding in the archives of the customs some record of these shipments.

"It was in relatively recent times that the exportation of the Hevea seeds was prohibited in the State of Para, and years afterwards in the State of Amazonas, a measure totally useless since none was adopted either in the State of Matto Grosso or in Bolivia where the richest rubber stands are found."

Coming Events

Mar. 18-20. N.A.W.M.D. Convention, Hotel Astor, New York City.

Apr. 2. Los Angeles Rubber Group, Mayfair Hotel, Los Angeles.

Apr. 5. Boston Rubber Group, University Club, Boston, Mass.

Apr. 11-12. Rubber Division, A.C.S., Hotel Gibson, Cincinnati, Ohio. (A. C. S. meets April 8-12).

Oct. 7-11. National Safety Congress, Stevens Hotel, Chicago, Ill.

GILLETTE ABSORBED BY U. S. RUBBER CO.

Stockholders of the Gillette Rubber Company, at a special meeting held in Eau Claire, Wisconsin, on February 29, approved absorption of the company by the United States Rubber Company. Dissolution of Gillette was voted at the same time. Gillette Rubber was organized in 1917, and will cease to exist as a separate corporation on March 31.

In a letter to Gillette stockholders, explaining the reasons why U. S. Rubber desired to absorb Gillette, principally in the interests of economy, H. E. Humphreys, vice-president of U. S. Rubber, stated that Gillette had earned $901,000, or $4.50 a share, last year. In the last five years, he stated, earnings had averaged about $2.75 a share annually and that a large part of the income had been derived from business given the company by U. S. Rubber.

For many years, U. S. Rubber has been a majority stockholder in Gillette. Several weeks ago it offered to pay $29.00 per share to minority stockholders for their holdings on or before February 29, the date set for the special stockholders' meeting. This offer has since been extended to March 29. At the time of the meeting, when absorption and dissolution was approved, U. S. Rubber held 93% of Gillette stock.

As far as could be learned, U. S. Rubber expects to continue the operation of the Eau Claire factory, the production of which is devoted to passenger automobile and bicycle tires.

INVENTORY VALUES REVEALED FOR 1937

Inventory values for materials and for finished goods held by rubber manufacturers at the beginning and end of 1937, as well as the customary statistics on total value of materials used and total value of products, are shown in the 1937 census report, a digest of which has been made by the Leather and Rubber Division of the Bureau of Foreign & Domestic Commerce, Washington, D. C.

Materials on hand at the beginning of 1937 were reported at $92,914,000 or 18.05 per cent of the total materials used during the year. Value of materials used was to value of finished goods as 100 is to 171.6, and raising the materials on hand to the equivalent finished goods value and adding this value to the inventory value of finished goods at the start of 1937 ($102,445,068), there results an inventory at finished goods wholesale value of $261,945,000, equal to 29.65 per cent of the total value of products for the year or 3.56 months supply. At the end of 1936, supplies of crude rubber were lower than they had been for over five years, and this was therefore a less than usual inventory for recent years.

Inventory Increased During 1937

At the end of 1937, the inventory value of raw materials was increased to $97,433,000 and of finished goods to $123,726,000 or raising raw materials to the finished goods wholesale equivalent the combined figure would be about $291,125,000, equal to 33.0 per cent of the total value of products in 1937.

The production value of rubber goods in 1938, however, was only 77 per cent of the 1937 total, according to statistics of the Rubber Manufacturers Association, Inc., which in terms of the census value of products for 1937 would mean a figure of $679,000,000 for 1938. Therefore the inventory which in terms of 1937 output meant 33.0 per cent or 4 months supply, was actually 42.9 per cent of 1938 output or 5.15 months supply. This shows how widely a fixed inventory value may vary in its weight on the market.

Effect of International Control

It is doubtless true that, insofar as crude rubber contributed to these inventory values, the effect of international control of supply was such that inventory accumulation would have occurred in late 1937 even if rubber manufacturers had been able to foresee the extent of the decline in output for 1938. It is apparently necessary to forecast the rate of business accurately, however, if any attempt is made to maintain inventories at a constant number of months supplies, but rubber production control nevertheless makes it necessary to buy when supplies are available, and makes it very undesirable to buy when supplies are not plentiful, because buying does not increase the amount available for any quarter for which the production rate has been fixed.

RUSSIA'S GOAL SET AT RUBBER INDEPENDENCE

The Soviet Union hopes to become completely independent of foreign sources of rubber by the end of the third five-year plan, that is, in 1942, according to a survey of that country's position published in a recent issue of the *Far Eastern Survey*. Considerable progress has already been made in this direction, according to the survey, mainly by use of various synthetic compounds.

In 1932 Russia was virtually 100% dependent on rubber imports. By 1937, the survey states, this dependency was reported to have declined to 30% or less and it seems safe to assume that this percentage has since still further increased. The present trend of international affairs lends particular importance to these statistics.

At the present time, the Soviets are probably producing synthetic rubber almost equivalent in amount to one-tenth of the annual world output of natural rubber, the survey states. This production is to be extended and the cultivation of rubber-bearing plants, as yet a negligible source of supply, is expected to yield a considerable harvest of this essential product by the end of the present five-year plan.

Absorbs Only 3% of Total

In the world consumption of crude rubber, however, the U.S.S.R. plays but a small part, absorbing only about 3% of the total. Even the recent barter agreement by which England is to supply the Soviet Union with rubber and tin in return for lumber is apparently merely an arrangement for filling orders which had already been placed and not an indication of increased demand. It is reported, nevertheless, that during September there was an active Soviet demand for United States re-exports of rubber.

Figures on actual synthetic production can only be estimated from the reported percentages of self-sufficiency in the product. On this basis it would appear that whereas around 19,000 tons were produced in 1935 something more than 70,000 tons were turned out in 1937. It was reported that during the first five months of last year output of synthetic rubber had increased about 25% as compared with the corresponding period of 1938, so that it seems logical to believe that production is now approaching the 100,000 ton mark or approximately 10% of recent annual world production of natural rubber.

Further expansion is contemplated during the current plan. The capacity of the producing plants is to be increased 66%; in all, seventeen new plants are to be built, fifteen of which will be small ones scattered over the country. The synthetic industry is expected to supply the raw material for all automobile tires and rubber footwear by 1942, except for the 15% which is to be covered by reclaimed rubber.

Efforts are also being made to improve the quality of the synthetic products, of which there has been frequent sharp criticism in the Soviet press. The aim now is to increase the life of the ordinary automobile tire to 21,000 miles.

In addition to the stress placed on production of the chemical product, the new five-year plan also contemplates extended acreage being given over to rubber plants. Output of natural rubber from this source is still unimportant but according to one report a yield of 30,000 tons is contemplated in 1942.

No Threat to Plantations

Should all the present plans mature and the Soviet Union become completely self-sufficient in this product after a few more years, the effect on the plantations of British Malaya and Netherlands India will be indirect rather than direct. The disappearance of a demand equal to present Soviet imports would not seriously affect rubber quotas.

To the extent that the development signifies any growing ascendancy of the synthetic over the real, however, it is a trend which may well cause concern, the survey concludes.

Accuses Sears-Roebuck

The Federal Trade Commission issued a complaint against Sears, Roebuck & Company on February 19 alleging unfair and deceptive acts in the merchandising of automobile tires and tubes. The charges are similar to those filed last January against Goodyear, Goodrich and Firestone, and go back to a series of tire sales held last year in which sweeping discounts were advertised. Sears-Roebuck, according to the F.T.C.'s charges, exaggerated the savings to consumers through advertised discounts. The advertised percentage of reduction was not based on regular list prices, actual savings averaging approximately 10 per cent rather than the 30 to 35 per cent claimed.

LARGER EXHIBITS PLANNED FOR FAIR

Both the B. F. Goodrich Company and the Firestone Tire & Rubber Company have renewed their contracts for exhibiting at the New York World's Fair this year and both companies are planning to expand their exhibits, it was revealed last month.

Seating capacity of Goodrich's outdoor arena, in which Jimmy Lynch and his troupe of "death dodgers" give anti-skid demonstrations of the company's tires, will be tripled, additional products will be exhibited inside the Goodrich building, and a new "surprise" attraction will be offered. An open air terrace overlooking the arena, for the comfort of the Goodrich dealer organization and guests, will also be constructed.

In signing the Firestone contract, Harvey S. Firestone, Jr., vice-president of the company, announced that plans had already been formulated for a new idea in the company's exhibit. The huge rotunda of the Firestone exhibition building will be transformed into a tropical jungle to depict the hinterland of Liberia, where the company maintains extensive rubber plantations. The various operations in clearing the land, planting and tapping will be dramatized. Highlight of the exhibit will continue to be the actual production of tires at the rate of one every four minutes.

Deering-Milliken Moves

Deering, Milliken & Co., Inc., suppliers of sheetings, drills, twills, moleskins, print cloths and other textile specialties to the rubber and other industries, moved into their new building at Church and Leonard Streets in New York City last month. The new enlarged and expanded facilities provided in the new building will enable the company to give better service to its trade.

CHIKSAN TOOL MOVING INTO NEW QUARTERS

Headquarters of the Chiksan Tool Co., manufacturers of ball-bearing swing joints, all-steel rotary hose, and similar products, used in the rubber and other manufacturing industries, are now established in the company's new factory in Brea, California. Machinery and equipment are being moved to the new plant from the former one at Fullerton, California, as rapidly as production schedules will permit. Sales for 1939 were the largest in the company's history, according to Earle R. Atkins, sales manager, with 1940 already offering indications that this year will exceed last year by a substantial margin. The Chiksan line is distributed nationally by the Crane Company, with Chiksan representatives located in principal cities to render specialized service.

REPORTS ON RUBBER IN CENTRAL AMERICA

Confidence in the ability of Central American countries to grow crude rubber in competition with plantation grades from the Far East was expressed recently by W. E. Klippert, manager of the Goodyear Tire & Rubber Company plantations in that country, according to a report from San Jose, Costa Rica.

"Many people ask if rubber can be grown here," Mr. Klippert is quoted as saying, "and if it can be grown profitably in view of the fact that wages in Costa Rica are nearly four times as high as those of the East Indies, where nearly 98% of the world's rubber comes from at present.

"The climate and soil in lowland Costa Rica, principally on the Atlantic side, are ideal for the culture of rubber. As far as the wage difference is concerned I believe that we can overcome this disadvantage by planting only the highest-yielding species of rubber.

"To illustrate, we have developed rubber trees which will yield 4,000 pounds, as against 700 pounds for the same area planted (in the East Indies)."

Goodyear has been experimenting in Costa Rica for several years and, while it is not yet growing rubber in commercial quantities, it is believed that excellent ground work has been accomplished for future development. The worst problem contended with to date, it is reported, is a leaf disease, unknown to crude rubber growing experts, which killed off most of the first planting.

TRADE RESTRICTS RUBBER RE-EXPORTS

In order to tighten its stand against re-exports of rubber during the current situation, the Rubber Trade Association of New York adopted a resolution on February 15 to the effect that every effort should be made to "restrict rubber re-exports to normal peace-time exports." At the same time, the Association was authorized by its directorate to appoint a special committee to confer with Government authorities on the problem.

The Association's move followed the announcement last month by the Army and Navy Munitions Board that it might be necessary to "crack down" on the trade to protect dwindling stocks in this country if re-exports of rubber continued to assume the "scandalous proportions" reached in recent months. On February 26, however, the State Department at Washington announced that it believes the re-exporting of rubber has been effectively stopped.

Normally, some 400 to 450 tons of crude rubber are re-exported from this country, largely to Canada and Mexico. In October, however, the total jumped to almost 6,000 tons, and has averaged about 1,000 tons in the past three months. It was feared, particularly by British officials, that a large part of the re-exports were reaching Germany and Russia through neutral countries.

Honor Monsanto Chemists

In addition to the members of the rubber industry who received recognition as "modern pioneers" and who were awarded certificates of merit last month at a series of sectional dinners held throughout the country, listed in our previous issue, two members of the Monsanto Chemical Company, omitted from the original list published, also received recognition. These two men were R. L. Sibley, director of research of Monsanto's Rubber Service Department at Nitro, West Virginia, honored for the discovery and development of a series of improved rubber accelerators, and J. R. Ingram, a chemist at the Nitro laboratory, for discovery and development of new rubber antioxidants. Three other Monsanto chemists, associated with various divisions of the company, were also honored.

Carbon Black Advances

Price advances on carbon black, ranging from one-fifth to one-quarter cents per pound for deliveries made during the second quarter of the current year, were announced by major producers on Friday, March 8. The new schedule of prices, f.o.b. plant, for rail shipments, are: in bulk, 2.5¢ per pound; beads or compressed in bags, 2.65¢ per pound; and uncompressed in bags, 2.8¢ per pound. The advance in the bead or compressed types, which are the types used in rubber manufacturing today, was .225¢. Export prices were also advanced on all new sales from March 8, the base price for export now being 3⅜ cents per pound, an increase of ⅛¢ per pound.

Weir Back from Brazil

Dr. James R. Weir, who recently made an extended tour of Brazil, primarily to determine the possibilities of increased rubber cultivation, has returned to the United States. Dr. Weir, who at one time acted as advisor for the Ford rubber plantations in Brazil, conferred with Brazilian leaders before his departure from that country with respect to agricultural developments in the Amazon Valley. He also submitted a plan for a large scale native rubber plantation industry to the Brazilian Government which is now under consideration. At present, Dr. Weir is privately engaged in writing and travel.

Addition for Goodrich

Ground has been broken and construction is expected to get under way immediately on a new $70,000 addition to Mill 3 of the Goodrich factory in Akron. The addition, which will be equipped with special processing equipment costing approximately $100,000, will be devoted exclusively to the manufacture of chemicals. It will have 22,500 square feet of floor area.

BAR BARGAINING OF MORE THAN ONE UNIT

In a decision rendered on February 17, the National Labor Relations Board at Washington, D. C., refused to consolidate the plants of two rubber manufacturers for purposes of collective bargaining. The ruling was made in two separate cases involving the United States Rubber Company and the B. F. Goodrich Company and its subsidiary, the Hood Rubber Co.

In the decision on the Hood case, the Board ruled that each plant has its own labor relations director and employment manager and that "wages, hours, working conditions and manufacturing processes vary greatly at the different plants." A petition filed by the United Rubber Workers of America, affiliated with the C.I.O., for a nation-wide bargaining agency for Goodrich and Hood employees, was accordingly dismissed.

Instead, the Board ruled, that an election be held within thirty days of the date of the decision among employees of the Hood plant at Watertown, Mass., to determine whether they wish to be represented by the U.R.W.A. or by the Rubber Workers Federal Labor Union (an A.F.L. affiliate) or by neither.

In the case of U. S. Rubber, the Board ruled that two elections be held at plants in Providence, R. I., and Passaic, N. J., within thirty days. At Providence, production and maintenance men will vote for representation by either the C.I.O. or A.F.L. affiliated unions or neither, while at Passaic the vote entails representation by the International Brotherhood of Electrical Workers, an A.F.L. affiliate.

Dissenting from the majority opinion, Edwin S. Smith, member of the N.L.R.B., stated: "Although there is a geographical separation of plants and decentralization of management, combination of all the rubber plants into a single bargaining unit is not impractical. It seems plain that, under the circumstances in this case, bargaining on the basis of a single unit embracing all the rubber plants is essential to insure the employees equal bargaining strength with the companies and the full benefits of collective bargaining."

Canada Sees Two Films

The manufacture of carbon black and its shipment in bulk was the theme of the meeting of the Rubber Section of the Canadian Chemical Association held on February 23 at the University of Toronto, Toronto, Canada. Two films dealing with the subjects, both shown by Godfrey L. Cabot, Inc., the first a colored movie showing the bulk shipment of carbon black from Corpus Christi, Texas, to Boston, Mass., and the second "Inside the Flame," the sound movie outlining the production and uses of carbon black, were highlights of the meeting. Approximately 55 members and guests attended the meeting, many of whom were guests of the Cabot concern at the Royal York Hotel in Toronto following the meeting.

PRODUCTION PICTURE IS STILL CHANGING

Although regulation of crude rubber production has resulted in more gradual shifts in the participation of various countries in world rubber production, it has not prevented such shifts. This is the conclusion of a survey on the world rubber production picture recently made by the Leather and Rubber Division of the Bureau of Foreign & Domestic Commerce, Washington, D. C.

Malaya Steadily Losing Ground

In 1929, the survey points out, after the end of the Stevenson Restriction Scheme, Malaya supplied 52.7 per cent of world output, and in 1929-1934 averaged 52.1 per cent, although in 1934 her share was but 45.9 per cent. Since then, owing chiefly to concessions to other countries in the International Rubber Regulation Agreement, her share has dropped below 40 per cent in both 1938 and 1939.

The Netherland East Indies supplied only 29.4 per cent of 1929 shipments, but averaged 32.1 per cent of world output in 1929-1934, rising to 37.3 per cent in 1934. The regulation agreement resulted in a temporary loss of percentage, which was however fully regained by 1939. Efforts to hold in check the growing production capacity of native producers in the Netherland East Indies became successful only after recognition of the natives through increased quota allotments.

Other British quota countries in the agreement supplied 12.9 per cent of 1929 shipments and 11.4 per cent of the 1929-1934 total. During 1935-1938 the share contributed by Ceylon, India and Burma, British North Borneo, and Sarawak declined somewhat, recovering to 11.5 per cent at the 1939 total.

The growth of production in Thailand and French Indochina, which while parties to the Agreement have not been limited severely by their engagements, is most striking. In 1929 these two countries supplied 1.6 per cent of world rubber production and they averaged only 2.4 per cent during 1929-1934, but in 1939 they accounted for 10.8 per cent.

Other Countries Increase Average

Countries not in the agreement supplied 3.7 per cent of world production in 1938 and 1939, against an average of only 2.0 per cent in 1929-1934. In 1929 they furnished 29,800 tons of rubber to world markets but this was mostly wild rubber, 21,300 tons coming from South America alone. Current production, 36,800 in 1939, included only 15,300 tons from South America, but there was notable growth in plantation rubber production in the Philippines, Papua, Liberia, Nigeria, and other countries in Africa, as well as in production of guayule rubber in Mexico.

At present non-quota countries supply over 14 per cent of world rubber output. In 1929 the same countries supplied only 5 per cent of the global totals.

PACKAGED RUBBER PRODUCTS AWARDED HONORS

Several packages used by rubber manufacturers to promote the sale of their products received awards in various packaging groups of the 1939 All-America Package Competition, sponsored by *Modern Packaging Magazine*. Three of these winners, illustrated above, were the "Uni-Pak" carton used by the Wilson Sporting Goods Co., Chicago, to stimulate the sale of 3 golf balls as a unit, awarded top honor in the Folding Cartons Group; a box for rubber tubing made so the tubing can be packaged in 50 foot lengths and cut into any length desired, used by the B. F. Goodrich Co., Akron, which received an honorable mention in the Set-Up Paper Boxes Group; and a can for rubber cement that serves directly as a dispenser, eliminating the need of a separate dispensing unit, used by S. S. Stafford, Inc., New York, which received an honorable mention in the Metal Containers Group. Several packages employing Pliofilm, the rubber derivative sheet developed by Goodyear, also won awards, including a new coffee package introduced by the William Montgomery Co., which uses Pliofilm as an inner lining; a button card which contains a sheet of Pliofilm between two pieces of board, entered by the Muscatine Pearl Works; and a window carton for pickles, with an inner bag of specially-treated Pliofilm, used by the H. J. Heinz Company.

Draft Revisions Available

A second draft on the proposed revision of Federal Specification for Rubber Goods, which include general specifications and methods of physical tests and chemical analyses, has been drawn and copies are available without cost to members of the rubber industry and users of rubber products. This second draft is designated as ZZ-R-601A, and requests for copies should be addressed to P. L. Wormeley, Chairman, Rubber Products Committee, Federal Specifications Executive Committee, National Bureau of Standards, Washington, D. C. Reasons for the proposed revision were outlined in the September, 1939, issue of THE RUBBER AGE.

Thiofilm Compounds

Under the trade-name of Thiofilm, the O'Day Company, Holland, Michigan, has introduced a line of flexible oil-proof synthetic rubber compounds, or dispersions, made with a "Thiokol" base. Thiofilm is furnished in a viscous paste form. It is said to be highly elastic and to dry tack free, making it a good coating material for rubber, cloth, paper or other products which need protection from oil, ozone and sunshine.

Offer Airplane Service

Inauguration of private airplane service for the benefit of rubber manufacturers throughout the country who may have difficulties with their Banbury mixers, has been announced by G. A. McLean, president, Interstate Welding Service of Akron, Ohio. The company has purchased a monoplane which will be kept at the Akron Airport and in instant readiness for use by Interstate trouble-shooters when they are called to distant points to quote on Banbury rebuilding work. Established seven years ago, Interstate Welding Service is now operating a fully-equipped machine and welding plant for the complete and rapid rebuilding of Banbury mixers.

Opens Office in Dallas

Wishnick-Tumpeer, Inc., manufacturers and importers of chemical products for the rubber and other industries, has announced the opening of a new southwestern office in the Dallas National Bank Building, Dallas, Texas. The new office will service and offer technical assistance to users of carbon blacks, pigments, fillers, oils, asphalts and numerous other products sold under the Witco and Pioneer brand names.

Names in the News

HARRY F. WEBSTER, vice-president, Denman Tire & Rubber Co., Warren, Ohio, was elected president of the Warren Chamber of Commerce at the annual meeting of directors of the Chamber held on February 27. He succeeds B. N. MACGREGOR, general manager, Packard Electric Division, General Motors Corporation.

P. W. BEGGS, superintendent of the tire fabric mill of the Goodyear Tire & Rubber Company at Los Angeles, has been transferred to the superintendency of the new tire fabric mill constructed by the company in Brazil to supply its Brazilian tire factory. He sailed for his new post early this month.

WILLIAM J. CREHAN, chemist, Baldwin Rubber Co., Pontiac, Mich., was awarded fourth prize in the Second Annual Instrumentation Contest, sponsored by *Instruments Magazine*. His paper, entitled "Testing Instruments, Too, Pay Dividends," appears in the January, 1940, issue of the publication.

PAUL M. IRWIN, in charge of manufacturers' tire sales for the Dominion Rubber Co., Ltd., Kitchener, Ontario, for the past six years, has been named sales manager of the tire division of that company.

EDWARD EVANS, a member of the advertising staff of the U. S. Rubber Company for the past several years, has been named advertising manager of the Fisk Tire Division to succeed Henry Hurd. The latter, who resigned shortly after U. S. Rubber's acquisition of Fisk, is now associated with Mechanical Man, Inc., of New York City.

LOUIS GARBI, specialist for the past ten years in hot and cold asphalt mixes, who was associated with the Pioneer Asphalt Co., Chicago, many years ago, has rejoined that company in a sales capacity.

E. E. PARRISH, assistant manager, export division, Gates Rubber Co., Denver, Colorado, left Denver on February 11 for a three months sales trip through Latin American countries. Most of the trip will be made by air.

HARRY L. FISHER, Research Laboratory, U. S. Industrial Alcohol Co., Stamford, Conn., gave a lecture on "Synthetic Rubbers" before the Pennsylvania Chapter of the American Institute of Chemists in Philadelphia on January 30.

RICHARD S. HAYES, associated with the Okonite Co., Passaic, N. J., since 1925, has been appointed advertising manager of both the Okonite and the Okonite-Callender Cable companies.

M. E. LERNER, Managing Editor of THE RUBBER AGE, and Mrs. Lerner are to be congratulated on the arrival of another daughter, TERRY ELLEN LERNER, on February 17. At latest report, mother, father, daughter and sister are doing well.

FRITZ POPPER, former editor of *Gummi und Asbest-Zeitung*, rubber journal published in Vienna, Austria, until the country was annexed by Germany, is now in the United States. He may be reached in care of Pension Strauss, 808 West End Avenue, New York City.

R. E. RILEY, associated with the B. F. Goodrich Company for the past ten years as a junior sales executive, has joined the Mansfield Tire & Rubber Co., Mansfield, Ohio, as assistant general sales manager.

JOHN C. GEBHART, who has been active in the research field since 1913, working with various groups and organizations, was appointed director of research for the National Association of Manufacturers on March 4. He will be located at the Association's general offices at 14 West 49th Street in New York City.

L. D. WALKER, chief chemist, Triangle Conduit & Cable Co., Elmhurst, L. I., N. Y., was recently elected to the executive committee of the New York Group, Rubber Division, A. C. S., to serve the unexpired term of the late ROBERT BERKOWITZ.

C. W. SEIBERLING, vice-president, Seiberling Rubber Co., Barberton, Ohio, was honored as Akron's No. 1 Citizen by the Akron Lions Club at a dinner held in Akron on February 13.

CLIFFORD H. RAMSEY, general manager of John Royle & Sons, Paterson, N. J., since January, 1939, was elected treasurer of the company as well at a recent meeting of the board of directors. His son, JUSTIN H. RAMSEY, was elected a vice-president.

GEORGE W. LAMPMAN, design engineer, Pontiac Motor Division, General Motors Corp., Pontiac, Mich., has been placed on special assignment in charge of all rubber developments. The appointment was made in recognition of the growing importance of rubber in automobile construction.

R. B. MARR, chief chemist, and GEORGE B. RUTHERFORD, manager of special products sales, Dominion Rubber Co., Ltd., Montreal, have been advanced to assistant general manager of manufacturing in the mechanical rubber goods division and assistant general manager of mechanical rubber goods and sundries sales, respectively.

Heads Canadian Seiberling

R. J. Thomas, who was vice-president, treasurer and general manager of the Seiberling Rubber Company of Canada, Ltd., for the past several years, was elected president and general manager of that company at a meeting of the shareholders held on January 27. Other officers elected were C. E. Jones, vice-president; M. L. Brown, vice-president in charge of production; and H. W. Gregory, vice-president in charge of sales. F. A. Seiberling was elected chairman of the board.

Changes at Manhattan

Several changes in executive personnel of the Manhattan Rubber Manufacturing Division of Raybestos-Manhattan, Inc., Passaic, N. J., have been made, caused by the recent death of Col. Arthur F. Townsend who was chairman of the board of the company and general manager of the Manhattan Rubber division. Frederick L. Curtis, treasurer of the parent concern, who had been acting as assistant general manager of Manhattan Rubber, was named general manager; H. E. Smith, sales manager of the division, was named assistant general manager; and J. H. Matthews, who had been in charge of several departments at the Passaic plant, was made assistant factory manager. Charles T. Young continues as factory manager. Mr. Curtis, the new general manager, began his career in the rubber business in the Sandy Hook, Conn., plant of the New York Belting & Packing Co., and left that company to join Manhattan Rubber shortly after Col. Townsend and others organized that company.

Shift Tire Headquarters

Dominion Rubber Co., Ltd., Canadian subsidiary of the United States Rubber Company, has shifted the headquarters of its tire sales division from Montreal to Kitchener, Ontario. The move was made in order to obtain closer cooperation among tire engineering, development, production and sales departments.

FINANCIAL NEWS

GOODYEAR NET PROFIT REACHES $9,838,797

For the year ended December 31, 1939, the Goodyear Tire & Rubber Company reports a net profit of $9,838,797, after depreciation, interest, subsidiary dividends, Federal income taxes, and a deduction of $1,791,602 to reduce the value of net current assets in foreign countries to reflect rates of exchange prevailing at the year-end. The result is equivalent to $3.20 a share on 2,059,168 no-par common shares, excluding 2,288 shares in the company's treasury, after provision of payment of $5.00 preferred dividend requirements, and compares with net profit of $6,012,423, or $1.34 a common share, in the preceding year.

Consolidated net sales for the year of 1939 amounted to $200,101,704, an increase of 20% over the $165,928,944 reported for 1938. Consolidated earnings for 1939 operations amounted to $13,981,110, before interest and deduction for minority equities, but after reserving $9,031,416 for depreciation of plant buildings, machinery and equipment, and after deduction of $21,935,486 for taxes and duties of all kinds.

The consolidated balance sheet shows $27,493,622 of net current assets abroad, and $28,207,340 of net property accounts, principally represented by manufacturing companies in Canada, Great Britain, Sweden, Brazil, Argentina, Australia and Java, and rubber plantations in Sumatra, the Philippine Islands and Central America. European hostilities did not adversely affect the operation of any of these foreign properties during 1939, according to the report.

Current assets at the year-end amounted to $109,251,502 and current liabilities to $16,105,813, a ratio of approximately 7 to 1. This compares with $106,121,405 and $9,142,000, respectively, at the end of 1938. Current assets at the end of 1939 included $25,627,375 cash on hand and in banks, $53,267,037 in inventories, figured at cost or market, whichever was lower, $31,558,297 in accounts and notes receivable, and $79,870,033 in property accounts, including land, buildings, machinery and equipment.

The report reveals that during 1939 the company's funded debt was reduced by $5,000,000 by anticipation on account of notes arranged in connection with the refunding operation effected in December, 1938, and by retirement of $500,000 through the operation of the sinking fund for First Mortgage and Collateral Trust, Series A, 3½% bonds. The remaining $5,000,000 of notes were adjusted to an interest basis of 1½% per year, maturing $1,000,000 annually during the next five years.

In a statement accompanying the report, P. W. Litchfield, president, revealed that Goodyear employed 45,686 during the year of 1939 and paid them a total of $57,269,980 in salaries and wages. He also revealed that the company's unit sales of tires in the United States increased 40% while outside of the United States they increased only 7%. Reference was also made to the fact that during 1939 Goodyear completed and started operations in new tire factories in Sweden and Brazil and a new mechanical rubber goods plant in St. Marys, Ohio.

B. F. GOODRICH CO. TRIPLES ITS PROFIT

Net earnings of the B. F. Goodrich Company for 1939, not including those of certain foreign subsidiaries, amounted to $6,628,746, after all charges and provision of $1,200,000 for Federal income taxes. This is approximately three times the profit of $2,240,119 reported for 1938, which included earnings of the foreign subsidiaries not consolidated in the 1939 report. The 1939 earnings were equivalent to $3.50 each on the 1,303,255 shares of common stock outstanding, after deduction of the regular $5.00 per share dividend on the preferred stock, which compares with 14 cents a share the year before.

Consolidated net sales for 1939 amounted to $135,735,562, an increase of 24% over the $109,439,262 reported for the previous year. The consolidated balance sheet shows total current assets of $74,263,793 as of December 31, 1939, including $11,345,261 in cash, and current liabilities of $11,006,156, a ratio of approximately 7 to 1. Net working capital at the year-end was reported at $63,257,636. Inventories amounted to $37,239,383.

The report reveals that the 15-year 6% convertible gold debentures of the company, due in 1945, $18,319,200 of which were in the hands of the public, were redeemed during 1939 at the redemption price of 103% of their face value plus accrued interest. The total cost was met from the proceeds of $18,000,000 of 3% bank loans and $1,055,082 of cash. The refunding of these debentures will save the company an estimated $330,000 annually in interest costs. The agreement with the banks on the $18,000,000 loan calls for payment on account of principal of $1,200,000 each year, the balance becoming due on June 1, 1945.

General Cable Corp.

For 1939: Net income of $733,166, after all charges and provisions for taxes, which compares with net loss of $893,714 reported in the preceding year. Net sales in 1939 amounted to $3,860,587, contrasted with $2,368,941 in 1938.

$138,929 DIVIDENDS SET BY SEIBERLING

Dividends totalling $138,929 on all classes of its preferred stocks were declared by the Seiberling Rubber Company on February 27. The dividend on the $2.50 convertible prior preference stock was for 45c per share, on the Class A preferred for $1.25 per share, and on the Class B preferred for $75.38 per share, covering the period from January 1, 1930, to June 1, 1939. In each case the dividends were payable on April 1 to stockholders of record on March 15.

The company's action eliminates dividend arrearages on the Class B preferred stock and clears the way for resumption of dividends on the Seiberling common stock. The Class B stock is non-cumulative after June 1, 1939. Payment of the back and current dividends was made possible through the development and completion of Seiberling's refinancing plans through the sale and issue of 28,000 shares of $2.50 convertible prior preference stock to investment bankers last January.

After the directors' meeting at which payment of the dividends was decided it was also announced that all officers of the company were reelected to their former offices with the exception that C. W. Seiberling was elected to the office of first vice-president and A. M. Vaughan to that of vice-president and treasurer.

MOHAWK RUBBER CO. INCREASES EARNINGS

Based on net sales of $3,177,997, the Mohawk Rubber Co., Akron, Ohio, reports a net profit of $301,782 for the year of 1939, equal to $2.23 per share of outstanding stock, which compares with net profit of $273,231, or $2.06 a share, based on net sales of $3,096,459, reported for the preceding year. The 1939 profit was derived after providing for all expenses, including $68,063 for depreciation and $287,088 for direct taxes.

The consolidated balance sheet as of December 31, 1939, shows current assets of $1,052,851, including $148,195 in cash, $581,884 in trade acceptances and accounts receivable, and $322,771 in inventories. Current liabilities are listed at $216,842, including $128,821 in accounts payable, $25,578 in accrued taxes and interest, and $62,442 in Federal taxes on income.

Thermoid Company

For 1939: Net income of $432,304, after all charges, equal to 65 cents a share on the common stock after providing $119,868, or $3.00 a share, on the outstanding convertible preferred stock. These are the largest earnings reported by the company since 1929, and compare with $19,952 for 1938. Current assets as of December 31, 1939, totaled $2,856,710, against current liabilities of $850,251.

Monsanto Chemical Co.

For 1939: Net income of $5,546,416, which after all charges and allowances for preferred dividends is equal to $4.01 a common share. This compares with $2.35 a share in 1938 but is below the $4.40 per share earned in 1937 on a smaller sales volume. Total net sales reported by the company for 1939 were $42,982,599. A statement accompanying the report indicates that the rubber industry in 1939 was the fifth most important industry to the company in point of consumption of products. It was fourth in 1936.

Dewey & Almy Chemical

For 1939: Consolidated net profit of $624,539, which compares with $270,063 in the previous year. After allowing for dividends of $110,270 on the $5.00 convertible preferred stock, the 1939 earnings were equal to $2.66 on each of 193,535 shares of combined common and Class B common stock outstanding. This compares with payment of 82 cents a common share in 1938.

American Hard Rubber Co.

For 1939; Net profit of $386,123, after all charges, equal after dividend requirements on the 8% cumulative preferred to $3.12 each on 65,503 shares of $50 par common stock. This compares with net profit of $47,555, or $2.09 each on 22,682 shares of 8% preferred, in the preceding year.

Dunlop Tire & Rubber Goods

For 1939: Net income of $223,992, equal to $3.22 each on 56,768 common shares after allowing for preferred dividends, which compares with net of $90,937, or 88 cents a common share, in the previous year.

New Firestone Plant?

According to a report from Brazil, the Firestone Tire & Rubber Co., Akron, is considering building a tire factory in Sao Paulo. The company is known to have purchased sufficient land for the erection of such a plant some time ago.

Tires for Toys

The rubber industry will sell approximately 100,000,000 tires during the coming year to manufacturers of toy automobiles, scooters, wagons, planes, trucks, and tractors, according to an estimate made by J. H. Connors, vice-president, B. F. Goodrich Co., Akron. This figure represents more than twice the number of tires used annually on the nation's automobiles. It is a decided increase over actual annual consumption of this type of tire in previous years.

Milwaukee Firm Busy

The largest volume in its 15-year history was enjoyed during 1939 by the Non - Breakable Button Corporation, makers of rubber buttons and other products, of Milwaukee, Wisconsin, according to A. D. Bullerjahn, general manager. A modernization program launched by the company last year is rapidly nearing completion. The plant has been almost completely rearranged and new equipment, much of it designed by Mr. Bullerjahn himself, has been installed. The modernization program has been credited with the company's ability to reduce its selling prices considerably and to increase production of buttons to more than 500,000 a day.

Maintain Quota at 80%

Meeting in London on February 20, the International Rubber Regulation Committee decided to leave the export quota for signatory countries to the restriction scheme for the second quarter of the year unchanged at 80% of basic quotas. It is estimated that under an 80% quota for the first six months of the current year world consumption of crude rubber will fall approximately 100,000 tons short of potential new supplies so that this amount can be added to depleted stocks in consuming countries, unless a sizable amount of rubber should be destroyed by ship losses en route from producing countries.

Canada Wire & Cable

For 1939: Net profit of $690,805, equal after dividend requirements on 28,741 shares of 6½% cumulative preferred stock and on 29,669 shares of $4.00 cumulative preferred Class A stock to $2.56 each on 150,662 shares of Class B common stock. In the preceding year a net profit of $462,655, or $1.04 each on 150,662 shares of Class B common stock, was reported.

Raybestos-Manhattan, Inc.

For 1939: Net income of $1,605,296, or $2.54 per share, after providing $711,679 for depreciation and $426,192 for Federal and state income taxes. Total assets as of December 31, 1939, were listed at $18,554,390, including $10,293,506 of current assets, equal to approximately 6 times the current liabilities.

Hewitt Rubber Corp.

For 1939: Unaudited report reveals net earnings of $358,810, equal to $2.13 a share, which compares with $83,352, or 50 cents a share, in the preceding year. According to Thomas Robins, Jr., president, sales and earnings for 1939 set a new all-time record for the company.

L. H. Gilmer Co.

For 1939: Net profit of $98,275, or $1.18 each on 82,824 shares, which compares with $60,134, or 72 cents, in the previous year. The report shows current assets at the year-end of $396,039 and current liabilities of $204,138.

Goodrich of Canada

For 1939: Net loss of $8,985 before income bond interest, which compares with net loss of $237,318 in 1938 before a similar charge. Losses for both years were figured in Canadian currency.

Quaker Changes Name

The Quaker City Rubber Company, manufacturers of mechanical rubber goods, located at Comly and Milnor Streets, in Philadelphia, Penna., has formally changed its name to the Quaker Rubber Corporation.

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MICRONEX MEANS MORE MILEAGE

Los Angeles News

The Quaker City Rubber Company, 2036 Santa Fe Avenue, is in the process of changing its name to the Quaker Rubber Corporation, according to the local office. C. C. Harris, sales manager for the Pacific Coast, spent several days in Los Angeles and vicinity early in March.

W. H. Fleming, manager of general merchandise control for the Goodyear Tire & Rubber Company at Akron, spent a portion of February in Los Angeles on a business mission.

The Kirkhill Rubber Company is moving its entire tubing machine plant to its new building modernized for the purpose on a site recently acquired. In addition to those being moved from the main plant two new Royle tubers and three mills are being added, according to T. Kirk Hill, president. This company is now turning out a new line of rubber soles for sports shoes, production at the present time running about 20,000 pairs a month. Orders ahead justify the increased production volume, Mr. Hill states. The product is being sold to several nationally known shoe manufacturers.

Rubbercraft Corporation of California has recently installed a new platen press, 8 x 20 feet, devoted largely to the manufacture of airplane factory equipment.

A new item being turned out by the Latex Seamless Rubber Company, 4620 East Washington Street, is a latex-covered acid bucket which the president, Carl E. Stentz, feels is an improvement over anything on the market. The bucket has a metal base and is entirely covered inside and out with latex, the surfaces being slightly corrugated. The bucket is made in two sizes, 12-quart and 8-quart, and has a stainless steel handle. The covering is resistant to most acids, Mr. Stentz states, and will not chip or crack. The electro-deposition process is used in manufacture. Patents have been applied for.

The Rod and Gun Club at Goodrich has been revived with Ed Keith of the shipping department as president. Several events are being planned for the ensuing season.

G. E. McDonald has been transferred from the time study department of the Goodrich plant at Akron to the same department in the Los Angeles plant.

Frank L. Shew, chemist for the Darnell Corporation in Long Beach, is recovering from an operation for appendicitis.

W. J. Voit of the W. J. Voit Rubber Corporation made a business trip to Chicago this month, flying both ways.

Karl Dunkel, who has been in the employ of DuPont at El Monte, Los Angeles suburb, has gone to Melbourne, Australia, where he will be associated with Frank Beaurepair in the installation and directing of a rubber reclaiming plant. Mr. Dunkel has been very active in the Los Angeles Rubber Group for many years and was the recipient of a farewell bon voyage gift. He sailed on Wednesday, February 28.

C. M. Spinning, control manager for the U. S. Rubber Company, is slated to leave April 1 for Buenos Aires, Argentina, where he will fill a similar position in the U. S. Rubber Company's plant. Prior to coming to Los Angeles about a year and a half ago Mr. Spinning was control manager of the textile division of the plant at Hogansville, Georgia. As Mr. Spinning is a native of Chile he will not be a stranger in a South American atmosphere.

F. S. Carpenter was due to reach Buenos Aires, March 6, where he is to be operations manager of the U. S. Rubber Company's plant, a position similar to that he held here.

The Goodrich factory is undergoing a thorough house cleaning, everything washable is being washed and everything paintable is being painted.

William C. Holmes, manager for the Dill Manufacturing Company, chairman of the Los Angeles Rubber Group, has completely recovered from a threatened attack of pneumonia and was able to preside at the March meeting of the group.

C. W. Race, recently re-named activity chairman at the Goodyear plant, has named his sub-committees for the ensuing year, and extensive plans are being made to foster every sport or activity in which a group large enough to be interesting and interested can be mustered. About twenty activities' calendar events are already scheduled.

Sailing for Brazil shortly will be Glen McGehee, Robert Lord and A. L. Michael, Californians, assigned new duties as aids to Percy Beggs, former textile mill superintendent here, now in Goodyear's plant in Brazil. The boys were given a big send-off when they left.

Goodyearites are proud of improved position taken in the 1939 safety contest, finishing seventh place among Goodyear plants, a gain of five places as compared with the previous year. With the average number of employees for the year at 1,153 and the hours worked totaling 2,592,774, the plant wound up the year with only eleven accidents which caused a loss of only 192 days time.

DR. STINE REVIEWS GAINS IN CHEMISTRY

Organic chemistry, a relatively new and 100 per cent American industry, is contributing to the eventual independence of the United States in respect to rubber, Dr. C. M. Stine, vice-president, E. I. du Pont de Nemours & Co., Inc., declared in a review on the recent occasion of his receiving the Perkin Medal of the Society of Chemical Industry.

Development of synthetic rubber-like materials through research in organic chemistry was emphasized by Dr. Stine as only one of the contributions of this new industry to a decreased dependence of the United States upon foreign countries for raw materials, and, also, as only one of its contributions to the rubber industry.

The new synthetic materials developed in the last few years, Dr. Stine said, have been "accorded a hearty welcome by fabricators of rubber goods. Although these 'chemical rubbers' are different in composition from natural rubber, the physical properties of certain of these synthetic materials are quite similar to those of rubber, and at least one of these materials—neoprene—has qualities not found in the natural product, including resistance to oils, greases, chemicals, sunlight and oxygen. These chemical rubbers are accordingly filling hundreds of needs that natural rubber cannot fill."

Quite aside from the development of a chemical rubber, however, Dr. Stine emphasized that organic chemistry was responsible for tremendous improvements in the treatment and manufacture of natural rubber, declaring that it "has been in no small degree responsible for the fact that automobile tires today give some 25,000 miles of service as compared to only 5,000 miles only a few years ago."

"Of outstanding importance in the manufacture of rubber goods," he continued, "are the new and improved organic accelerators, antioxidants, sunchecking inhibitors, and agents which nullify the destructive influence of slight traces of copper."

Furthermore, Dr. Stine pointed out that organic chemistry had made important contributions to other industries, such as automobiles, petroleum, textiles, agriculture, plastics, and many others, all of which, directly or indirectly, have increased the use and sale of rubber.

Emmett Ross of the Goodyear development department was transferred on March 1 to the Goodyear textile mill at Cartersville, Georgia, where he will have charge of fabric testing and fabric specifications.

A letter from G. G. Balazs, now in the Goodyear plant in England, announces that he has abandoned his gas mask worn to and from work but still keeps one on hand in his office and one in his room. His family is now in America living at Madison, Wisconsin, where they will remain for the duration of the war.

Obituaries

B. D. Porritt

Benjamin Dawson Porritt, director of research for the Research Association of British Rubber Manufacturers and one of the most widely known British rubber technologists, died at his home, in Croydon, England, at the age of 56, on January 28. Associated with the rubber industry since 1907, Mr. Porritt received almost every honorary award bestowed by British organizations for distinguished work in rubber technology, including the Colwyn Medal.

Mr. Porritt was born in Manitoba, Canada, in 1884, and received his education at the Whitgift Grammar School in Croydon, University College Hospital in London, and Medical School and Heriot Watt College in Edinburgh. In 1907 he entered the rubber industry as a chemist for the North British Rubber Company, became works superintendent in 1910, chief chemist in 1912, and research superintendent in 1916. When the R.A.B.R.M. was formed in 1920 he was appointed director of research, a post he held until his death.

Long a member of several technological societies, Mr. Porritt was active in many of them. He was a vice-president of the Institution of the Rubber Industry and chairman of its Examination Board, and a Fellow of the Institute of Chemistry, Institute of Physics, and the Royal Society of Edinburgh. He was a member of the councils of both the I.C. and the I.R.I. at various times.

Thomas L. Robinson

Thomas Linton Robinson, one of the founders and one-time president of the Republic Rubber Co., Youngstown, Ohio, now part of the Lee Rubber & Tire Corporation, died at Zurich, Switzerland, on February 20, at the age of 59, following a long illness which developed from a nervous breakdown. Mr. Robinson received an LL.D. from the University of Michigan, was a member of a law firm in Youngstown, Ohio, for a few years, and then launched into a banking career which carried him up to the vice-presidency of the Guarantee Trust Company of New York. He was active in relief duties during the World War and was signally honored by both Italy and Belgium. He later served as assistant to one of the members of the Dawes Commission. In recent years, Mr. Robinson had been teaching American history and economics at the University of Switzerland. He leaves a widow and two children.

Joseph A. Angin

Joseph A. Angin, a former vice-president of the United Color & Pigment Co., Newark, N. J., died at his home in Maplewood, N. J., on February 12, at the age of 42. Born in Newark, he attended St. Benedict's Preparatory School in that city and was graduated from Notre Dame. He leaves a widow and two sons.

Bliss-Fabyan Liquidates

After a record of 108 years of continued business, starting from a partnership in 1832, Bliss Fabyan & Company, prominent commission house in the textile field and well known to the rubber industry through its sale of ducks, sheetings, etc., announced last month that it was voluntarily discontinuing its business. It will have no successor, and arrangements have already been made for future handling of all mill accounts previously served. For the past 60 years the general offices of the company were located at 32 Thomas Street in New York City.

New Film on Tires

A new film depicting the story of tire building, under the name of "Pattern for Industry," has been completed by the Fisk Tire Division of U. S. Rubber Co., Chicopee Falls, Mass. Prepared under the direction of C. Edgar Maynard, operations manager of the plant, the theme of the film is New England craftsmanship. It will be shown at Fisk salesmen's and dealers' meetings and used for general promotion.

Fan Decision Upheld

The United States Circuit Court of Appeals for the Second Circuit on February 26th handed down a decision upholding that of the lower courts with respect to the rights of the Samson-United Corporation, Rochester, N. Y., in the manufacture of flexible rubber-bladed fans. The decision in this case was against Henry I. Emanuel and the Signal Manufacturing Co., Inc., of Lynn, Mass., who were manufacturing a similar type of fan. The original patent on these rubber-bladed fans was issued to A. O. Samuels, president of Samson-United, on October 5, 1937.

Status of Barter Rubber

Emergency stocks of crude rubber received in the United States under the barter agreement of rubber for cotton between this country and the United Kingdom amounted to 2,322 long tons on February 24, according to official announcement, and stocks of rubber under the plan afloat to the United States on or about that date amounted to 4,072 long tons. Extension of the agreement period from June 30 to September 30 was also officially confirmed.

Building Purification Plant

A Seaboard Process type of liquid purification plant will be built at Borger, Texas, for the J. M. Huber Corporation, manufacturers of carbon black, by the Koppers Company of Pittsburgh, Penna. The plant, which will be the largest ever built for the purpose, will be employed to remove hydrogen sulfide from natural gas which is to be used in the manufacture of the blacks. Adoption of the Seaboard Process will comply with limitations which have recently been placed upon the sulfur concentration in carbon black by some purchasers, it was announced. It also is intended to meet increasing restrictions on the use of sweet gas for the production of blacks. The Seaboard Process type of purification plant is a continuous absorption and actification process in which the gas is scrubbed in an absorber tower with a solution of sodium carbonate. The new plant, which will have a capacity of 70,000,000 cubic feet of gas a day, is expected to be in operation by the middle of May.

New England

Russell Mfg. Co., Middletown, Conn., will erect a new building to replace the Otterbein mill, destroyed by fire on February 27, President George M. Williams has announced. The loss was estimated roughly at $500,000, fully covered by insurance. The blaze was attributed to static electricity from the hands of a workman which ignited the inflammable chemical in a treating kettle for endless belts.

Until the new building is constructed, work of the Otterbein unit will be carried on in other parts of the plant. Among the materials destroyed was an order of machine gun covers for a foreign government, valued at $58,000. A large quantity of belting material was burned.

Norwalk Tire & Rubber Co., Norwalk, Conn., is erecting an accessory building on Glover Avenue. The unit will be of frame construction, 30 x 60 feet.

Chauncey S. Garland will be placed in charge of the footwear division of the proposed new tire, tube and footwear manufacturing plant to be launched at Buenos Aires, Argentina, by the United States Rubber Co. It is expected that the plant will be in operation by next September. Native Argentinian labor will be employed.

A former plant of the United States Rubber Company in Portland, Conn., vacant for many years, has been sold to the Standard-Knapp Corporation, of Long Island City, N. Y., makers of case and carton sealing equipment. The plant contains 45,000 square feet of floor area.

RHODE ISLAND CLUB HAS SPRING MEETING

Approximately 115 members and guests attended the Spring Meeting of the Rhode Island Rubber Club, held at the Narragansett Hotel in Providence, on March 1. Two speakers, R. L. Sibley, director of research, Rubber Service Division, Monsanto Chemical Co., and Edward Vail, sales engineer, Bakelite Corp., who replaced D. A. Munns, sales manager of the company, the scheduled speaker, featured the program. A bowling tournament was held at the Casino Bowling Alleys before the meeting.

Taking as his subject "Uses and Manufacture of Organic Accelerators," Dr. Sibley reviewed the history of organic accelerators from their inception and dwelt at length upon their wide uses in a great variety of rubber compounds. He also described the manufacture of several different organic accelerators and outlined a few of the problems the manufacturers of such accelerators had to meet to provide still more improved products.

The second speaker, Mr. Vail, discussed plastics in general and the phenol type in particular. He traced the history of the plastics industry since the discovery by Dr. Leo Bakeland, originator of Bakelite, and revealed that in 1939 the industry did an estimated dollar volume of $65,000,000. Consumption of plastics of all types, he said, grew from 144,000,000 pounds in 1936 to 300,000,000 pounds in 1939.

Mr. Vail also stated that although the plastics industry has taken some business away from rubber manufacturers, particularly in the case of steering wheels, radio parts, wiring insulation and gaskets, he felt that rubber and plastics were not basically competitive materials. He outlined several instances in which both materials were used jointly to produce better products. In concluding, he stated that the surface has not yet been scratched insofar as the possibilities of plastics in industry is concerned. Mr. Vail also showed "The Fourth Kingdom," a film depicting the manufacture and use of plastics.

Near the end of the meeting prizes were distributed in connection with the bowling tournament. These included one to Walter Miller for high single string, one to E. L. Hanna for high two strings, and a consolation prize to David Scott, Jr., chairman of the club. Arthur Davis was in charge of the tournament. Prizes were made available by contributions from the following: DuPont, Firestone, C. P. Hall, Monsanto, N. J. Zinc and R. T. Vanderbilt. L. K. Youse acted as chairman of the Prize Committee.

N. Y. Group Meets

A meeting of the New York Group, Rubber Division, A.C.S., was scheduled to be held at the Building Trades Club in New York City on March 15. Three speakers and two films constituted the program. The speakers scheduled were C. A. Norris, of the Bakelite Corporation, who was to talk on "Plastics Up-to-Date;" Per K. Frolich, of the Chemical Division, Esso Laboratories, Standard Oil Development Co., on "Trends in the Development of Synthetic Rubber;" and I. E. Lightbown, also of Standard Oil, on "Some Characteristics of Perbunan." The films scheduled were "The Fourth Kingdom," a Bakelite Corp. movie on plastics, and "Inside the Flame," a movie depicting the manufacture and uses of carbon black, prepared by Godfrey L. Cabot, Inc. A complete report on the meeting will appear in the next issue.

STENTZ ADDRESSES LOS ANGELES GROUP

Following out a new plan to have members of the group talk on their own businesses and problems, Carl Stentz, president, Latex Seamless Rubber Co., started the ball rolling at the supper meeting of the Los Angeles Group, Rubber Division, A.C.S., held on March 5, at the Mayfair Hotel in Los Angeles. Approximately 80 members and guests heard Mr. Stentz discuss the processes used at his plant. He also exhibited a large number of latex-covered items and outlined the advantages of each specific product.

Another feature of the program, arranged by Lee Horchitz (Goodrich), the Program Chairman, and presided over by William C. Holmes, Chairman, was a film picturing the processing and manufacture of aluminum and aluminum products. Ray Schmidgall, of the Aluminum Company of America, and several of his company associates, were on hand.

Special prize of the evening, an electric shaver donated by Ed Royal (H. M. Royal, Inc.), was won by L. F. McDonald (Goodrich). Door prizes, consisting of six bottles of perfume donated by Naugatuck Chemical through George C. Follett, local representative, went to J. A. Huff (U. S. Rubber), Frank Baglin (West American), Fred Woerner (C. P. Hall), Lee Horchitz (Goodrich), J. G. Krough (U. S. Rubber) and Frank Shew (Darnell). Table favors, in the form of "Scotch purses" containing imitation coins, were distributed through the courtesy of A. S. Rocklen of the Golden State Rubber Mills.

The next meeting of the group is set for April 2. A. S. Rocklen is tentatively scheduled to give a talk on the manufacture of golf balls. All meetings of the group are held in the Rainbow Room of the Mayfair Hotel.

See Carbon Black Film

The showing of "Inside the Flame," the film depicting the manufacture and use of carbon black, prepared by Godfrey L. Cabot, Inc., was the scheduled feature of the meeting of the Chicago Group, Rubber Division, A.C.S., held at the Hotel Sherman in Chicago on March 15. A technical representative of the Cabot concern was to have been on hand to answer any questions asked.

BOSTON GROUP PLANS AMBITIOUS PROGRAM

An ambitious program is planned for the next meeting of the Boston Group, Rubber Division, A.C.S., to be held at the University Club in Boston on Friday, April 5, at 6:00 P.M., according to James C. Walton, of the Boston Woven Hose & Rubber Co., Cambridge, Mass., chairman. The meeting will be held in the form of a plastics symposium.

According to present plans, the first speaker will be Professor Charles E. Reed of the Chemical Engineering Department of the Massachusetts Institute of Technology, who is an expert on plastics and who is giving a course on the subject at the Institute. Professor Reed will present a paper describing the two fundamental classes of plastics and discuss the general physical and chemical properties of these two fundamental groups. The presentation of this paper is expected to furnish the necessary background for four additional papers to follow.

Since plastics may be divided into four general classes, which are either being used in conjunction with rubber products today or separately in competition with rubber products, *i.e.*, vinylites, acryloids, cellulose derivatives and polyisobutylenes, it is planned to have papers presented by qualified speakers from the Bakelite Corporation, the Plastics Division of the Carbide & Carbon Chemicals Corporation, the Resinous Products Co., the Hercules Powder Co., and the Standard Oil Development Company, each speaker dwelling on one of these four classes of plastics.

Each talk, it is planned, will take approximately 20 minutes, and time will be provided after delivery for discussion and questions. To complete the symposium a moving picture illustrating different phases of the manufacture and use of plastics will be shown before dinner.

Swan Has Branch Plant

A branch plant in Carey, Ohio, has been purchased by the Swan Rubber Co., Bucyrus, Ohio, according to M. G. Nussbaum, president. The new plant, which will be devoted largely to the manufacture of friction materials, contains 34,000 square feet of working area. It is a three-story structure, located on a 14 acre plot. Approximately 30 workers will be engaged. Swan Rubber now employs approximately 375 in all. General offices will be maintained in Bucyrus.

Brazil Seeks New Market

Rubber cultivating interests in Brazil are seeking new markets to compensate in part for the loss of the German market which until recently has been absorbing approximately 40% of that country's crude rubber exports, according to the American Consulate at Para. It is hoped that the Brazilian rubber manufacturing industry will absorb part of the loss by increased use of rubber.

New Rubber Goods

Kello Rubber-Base Rug

Under the name of "America's Safest Rug," a new line of non-slip rugs was recently placed on the market by Kello Floor Coverings, Inc., Merchandise

Mart, Chicago, Ill. Made with a rubber base to which the tufting is inseparably bonded, the rugs can neither slip nor creep. The rubber base is formed to present myriads of tiny indentations which act as vacuum cups in holding the rug in any set position. Top or side stress increases the vacuum action, setting up a resistance to slipping that increases in direct proportion to the strain placed upon it. The natural resiliency and elasticity of the rubber eliminates all tendency to curl. The rubber also pads the rug, absorbs heel shock, and prevents the breaking down of the tufting fibres by spreading the pressure strain over a greater area. In the accompanying illustration, "A" indicates the tufting, "B" the sponge rubber base, and "C" the vacuum cup bottom.

Pliofilm Flower Pot Wraps

Potted plants may now be made more attractive through the use of new printed flower pot wraps made of Pliofilm, the rubber derivative product developed by the Goodyear Tire & Rubber Co., Akron, Ohio. The Lion Ribbon Co., 404 Fourth Ave., New York City, prints rolls of clear Pliofilm in the natural colors and designs of Grecian masters exhibited in New York's Metropolitan Museum of Art. Designs are laid out circumferentially so that when flower pots are placed on their centers and the wraps folded into place, the desired effect is obtained. The flower pot wraps have an inherent advantage in that they are water and moisture-proof so that there is no danger of surplus moisture seeping through and potted plants thus protected may be placed on tables or other finished surfaces without fear of water damage. Manufactured primarily for commercial florists, Pliofilm flower pot wraps are available in continuous rolls.

Milady's Mitties

Milady's Mitties, mittens made of Pliofilm, have been introduced by Giroux Industries, Inc., Norwalk, Conn. They are water, acid, alkali, grease and

germ proof, and find useful application in a number of household tasks, including washing windows and dishes, cleaning upholstery, sweeping, dusting, etc. They may also be used over dress gloves while motoring, in gardening work, in painting, and in protecting night clothes and bed linens from hand lotion stains while sleeping. Because of their resistance to many chemicals, these mittens are being adapted by workers in photographic studios and general laboratories. Milady's Mitties are available in two sizes, small and large, and are sold in packages containing four separate pairs.

M.S.A. Safety Insole

New protection for the feet against nails, spikes, sharp metal projections and other dangerous underfoot hazards is said to be provided in a new safety insole developed by the Mine Safety Appliances Co., Pittsburgh, Penna. Built of two layers of overlapping steel strips molded in rubberized fabric, the new sole is reported to be remarkably light and flexible and yet fully capable of pre-

venting injury from penetration of the boot-sole by sharp-pointed objects. The new soles are available in sizes from 6 to 12.

U. S. Farm Tractor Tire

A new and improved Lug Farm Tractor Tire has been introduced by the U. S. Tire Dealers Corp., New York City. An outstanding feature of the

new tire, it is claimed, is the fact that it is the first tractor tire so constructed as to work successfully on both the present conventional and the new wide base rims. Due to this construction, the tire actually serves a dual purpose in that it may be mounted one way to suit certain customers or in other ways for the type of assembly preferred by other purchasers. Other construction features include new, wide bars for wearing quality and added strength, and a concave face designed to improve traction and self-cleaning of the tread.

Rubber Duckpin Ball

As a companion product to its A.B.C. regulation bowling ball, the Manhattan Rubber Manufacturing Division of Raybestos-Manhattan, Inc., Passaic, N. J., has introduced a new duckpin ball. Like the regulation ball, the new one is made

as near a perfect sphere as is humanly or mechanically possible, with total variation in diameter within the thickness of a human hair. The new duckpin balls are made in standard black and in multicolor paisley designs.

MARKETS

RUBBER—COTTON AND FABRICS—CHEMICALS

NEW YORK, MARCH 11, 1940

Crude Rubber

STATISTICAL reports, rumors, trade interest and liquidation all combined in the past month to make the price of spot rubber on the Commodity Exchange follow one of its most erratic courses in months. From 19.25 on February 9, high for the period, the price broke to 19.06 on February 14, due largely to publication of the fact that crude rubber imports in January totaled 72,496 long tons, a new all-time high. Thereafter, a continued declining movement set in until the price touched 18.17, low for the period, on February 27, with March liquidation particularly depressing the price. Since February 27, however, the price has been moving upward steadily, with only one or two setbacks. Increased factory demand for spot and nearby deliveries was the primary factor in the advance. Today's quotation for spot (March 11) of 18.84 is the highest since February 27. Continued firmness is predicted. Quotations in the outside market, Exchange, London and Singapore, follow:

As of March 11

Plantations—

Ribbed Smoked Sheets—

No. 1 Spot	—	@	.18⅞
April-June	—	@	.18¾
July-September	—	@	.18½
No. 2	—	@	.18⅜
No. 3	—	@	.18⅛
No. 4	—	@	.18½
Thin Latex Crepe	—	@	.19
Thick Latex Crepe	—	@	.19
Brown Crepe, No. 1	—	@	.18⅝
Brown Crepe, No. 2	—	@	.18½
Amber Crepe, No. 2	—	@	.18⅜
Amber Crepe, No. 3	—	@	.18¼
Brown Crepe, Rolled	—	@	.15⅞

Latex—

Normal, per lb., carload lots.	—	@	.23½

Paras—

Up-River, fine	—	@	.17⅞
Acre Bolivian, fine	—	@	.18

Balata

Surinam sheet	—	@	.44

LONDON MARKET

Standard Smoked Sheets—Buyers—March 11

July-September	11½d	@	11⅝d
October-December	11¼d	@	11⅜d

SINGAPORE MARKET

Standard Smoked Sheets—Sellers—March 11

April-June	—	@	10 3/32d
July-September	—	@	9 1/16d

Reclaimed Rubber

Demand for reclaim remained dull last month. Reclaimers, however, are optimistic for the immediate future based on the general uptrend in business. Consumption of reclaim in January reached 17,596 long tons, 13% above that of the preceding month. There has been no change in the price structure since our last report.

Shoe

Unwashed, lb.	.06½	@	.06¾
Washed, lb.	.10	@	.10¼

Tube

No. 2 (Compounded), lb.	.09	@	.10
Red Tube, lb.	.09	@	.09¼

Tires

Black (acid process), lb.	.07	@	.07¼
Black, selected tires, lb.	.06	@	.06¼
Dark Gray, lb.	.09¼	@	.10
White, lb.	.12½	@	.14
Truck, Heavy Gravity, lb.	.05½	@	.06
Truck, Light Gravity, lb.	.07	@	.07½

Miscellaneous

Mechanical blends, lb.	.04½	@	.05

Scrap Rubber

(Delivered Akron Mills)

The scrap rubber market has been rather dull since our last report, with foreign trade practically stymied due to the difficulties of exchange. Increased business is seen as soon as this situation loosens up. Prices on several grades of scrap have been changed in the past month. Current quotations follow:

(Prices to Consumers)

Auto tire peelings, ton	21.00	@	22.50
Mixed auto, ton	13.50	@	15.00
Beadless tires, ton	17.50	@	19.00
Clean solid truck tires, ton	30.00	@	32.50
Boots and shoes, ton	20.00	@	21.50
Arctics, untrimmed, ton	14.00	@	15.00
Inner tubes, No. 1, lb.	.10	@	.11
Inner tubes, No. 2, lb.	.04¼	@	.04⅜
Inner tubes, Red, lb.	.04⅜	@	.04½

Cotton

Cotton prices have swung in a narrow range since our last report, high for middling uplands on the Cotton Exchange being 11.33 on February 26 and low being 10.95 on March 2. From a price of 11.12 on February 9, the price dropped to 11.01 on February 13, due largely to lack of trade interest, and then started an upward movement which culminated in the high for the period. This trend was attributed to a sharp upward move in the grain markets, reports of unfavorable crop conditions in the south, and recurring rumors of the outbreak of increased hostilities abroad. After February 26, however, the price turned downward, dropping steadily from day to day, with increased selling of hedges against 1938 cotton loan equities and long liquidation contributing to the decline. Activity has been dull in the past week, with the price rising and falling slowly from day to day. There is surprising strength, however, in distant months. Quotations for middling uplands on the Exchange follow:

	Feb. 9* Close	March 11* High	March 11* Low	March 11* Close
March	11.15	11.08	11.05	11.08
July	10.47	10.50	10.50	10.50
October	9.67	9.89	9.83	9.89

* New Contract.

Tire Fabrics

(Prices Net at the Mill)

Peeler, carded, 23/5/3, lb.	.31½	@	.31¾
Peeler, carded, 23/4/3, lb.	.32½	@	.32¾
Peeler, carded, 15/3/3, lb.	.29½	@	.29¾
Peeler, carded, 15/4/2, lb.	.29½	@	.29¾
Peeler, carded, 13/3/3, lb.	.28½	@	.28¾

CHAFERS

Carded, American, 1 1/16", lb.	.31½	@	.32
Carded, American, 1", lb.	.22½	@	.29

Sheetings

48x40	36	in.	5.50 lb.	—	@ .04
40x40	36	in.	6.15 lb.	—	@ .03½
40x36	36	in.	6.50 lb.	—	@ .03⅜
48x48	40	in.	2.50 lb.	—	@ .08½
48x48	40	in.	2.85 lb.	—	@ .07⅝
56x60	40	in.	3.60 lb.	—	@ .07
48x44	40	in.	3.75 lb.	—	@ .05½

Ducks

Enameling (single filling), lb.	.27	@	.28
Belting and Hose, lb.	.30	@	—
Single filling, A grade, lb.	.11½	@	.12½
Double filling, lb.	.12½	@	.13½

Closing Rubber Prices on New York Commodity Exchange, Inc.

No. 1 Standard Contract of 10 Tons

FROM FEBRUARY 9TH TO MARCH 11

Date	Spot	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Sales
Feb. 9	19.25	19.10	19.20	18.97	18.75	18.61	18.46	18.35	18.25	18.15	18.08	18.02	17.97	——	124
10	19.25	19.07	19.17	18.94	18.72	18.58	18.45	18.34	18.22	18.12	18.06	18.00	17.95	——	36
11	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
12	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
13	19.15	19.00	19.10	18.87	18.64	18.48	18.32	18.18	18.05	17.95	17.91	17.88	17.83	——	89
14	19.06	18.92	19.02	18.78	18.54	18.36	18.17	18.07	17.95	17.86	17.78	17.70	17.65	——	127
15	18.94	18.80	18.90	18.66	18.43	18.25	18.07	17.94	17.82	17.72	17.66	17.60	17.55	——	67
16	19.06	18.95	19.00	18.76	18.51	18.37	18.20	18.09	17.95	17.87	17.80	17.74	17.69	——	127
17	19.13	19.04	19.09	18.77	18.56	18.40	18.25	18.13	18.02	17.92	17.88	17.85	17.80	——	113
18	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
19	19.06	18.95	19.00	18.78	18.55	18.42	18.30	18.22	18.05	17.95	17.92	17.90	17.85	——	84
20	18.81	18.71	18.75	18.54	18.33	18.24	18.14	17.95	17.86	17.78	17.74	17.70	17.65	——	124
21	18.81	18.73	18.78	18.54	18.33	18.21	18.09	17.98	17.87	17.80	17.74	17.68	17.63	——	142
22	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
23	18.67	18.56	18.61	18.43	18.25	18.14	18.03	17.92	17.80	17.73	17.69	17.65	17.60	——	194
24	18.25	18.16	18.21	18.14	18.07	17.94	17.78	17.72	17.65	17.57	17.53	17.50	17.45	——	219
25	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
26	18.31	18.22	18.27	18.16	18.05	17.94	17.83	17.76	17.70	17.65	17.62	17.60	17.60	——	164
27	18.17	——	18.10	18.04	17.98	17.87	17.77	17.73	17.70	17.65	17.62	17.60	17.60	——	300
28	18.19	——	18.15	18.10	18.05	17.99	17.93	17.85	17.78	17.72	17.68	17.65	17.65	——	411
29	18.50	——	18.45	18.33	18.19	18.16	18.11	18.08	18.05	18.00	17.95	17.90	17.90	——	59
Mar. 1	18.50	——	18.42	18.31	18.18	18.12	18.03	18.01	17.95	17.92	17.84	17.76	17.76	17.76	94
2	18.67	——	18.59	18.50	18.40	18.29	18.18	18.12	18.06	18.01	17.95	17.90	17.90	17.90	56
3	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
4	18.47	——	18.38	18.32	18.26	18.18	18.10	18.02	17.95	17.90	17.85	17.80	17.80	17.80	46
5	18.70	——	18.50	18.45	18.39	18.30	18.20	18.14	18.08	18.03	17.96	17.90	17.90	17.90	64
6	18.75	——	18.60	18.53	18.46	18.39	18.32	18.27	18.23	18.18	18.12	18.06	18.06	18.06	200
7	18.75	——	18.58	18.51	18.45	18.38	18.32	18.26	18.21	18.16	18.10	18.05	18.05	18.05	17
8	18.83	——	18.66	18.55	18.45	18.39	18.34	18.27	18.20	18.15	18.10	18.06	18.06	18.06	107
9	18.72	——	18.55	18.50	18.45	18.38	18.32	18.25	18.18	18.14	18.10	18.06	18.06	18.06	54
10	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
11	18.84	——	18.67	18.65	18.62	18.53	18.44	18.40	18.37	18.32	18.22	18.12	18.12	18.12	149

New York March 12, 1940 Rubber CHEMICAL Markets

All Quotations F.O.B. Works Unless Noted

ACCELERATORS

Organic			
A-1 (Thiocarbanilid)	lb.	.24 @	.30
A-10	lb.	.31 @	.35
A-11	lb.	.52 @	.65
A-19	lb.	.52 @	.65
A-32	lb.	.70 @	.80
A-77	lb.	.42 @	.55
A-100	lb.	.42 @	.55
Aldehyde ammonia, crystals	lb.	.65 @	.70
Altax	lb.	.55 @	.65
Butyl Zimate	lb.	2.50 @	—
Captax	lb.	.50 @	.57
Crylene	lb.	.55 @	.65
Di-Ortho-Tolyguanidine	lb.	.44 @	.46
Diphenylguanidine	lb.	.35 @	.36
El-Sixty	lb.	.50 @	.65
Ethyl Zimate	lb.	2.50 @	—
Ethylidene aniline	lb.	.42 @	.43
Formaldehyde aniline	lb.	.37½ @	.42
Guantal	lb.	.40 @	.50
Hepteen	lb.	.35 @	.40
Hexamethylenetetramine	lb.	.33 @	—
Lead Oleate, No. 999	lb.	.14 @	—
Witco		.15 @	—
Lithex	lb.	.18 @	.20
Methylenedianiline	lb.	.36 @	.37
Monex	lb.	— @	2.35
Oxynone	lb.	.64 @	.80
Phenex	lb.	.50 @	.55
Pip-Pip	lb.	2.50 @	—
Pipsolene	lb.	1.55 @	1.85
R & H 40	lb.	.40 @	.41
R & H 50-D	lb.	.42 @	.43
R-2	lb.	1.40 @	1.80
R-2 Crystals	lb.	2.50 @	2.75
R-23	lb.	.40 @	—
RN-2	lb.	1.40 @	1.80
RN-2 Crystals	lb.	2.00 @	2.25
Rotax	lb.	.60 @	.65
Safex	lb.	1.20 @	1.30
SPDX	lb.	.70 @	.75
Super-Sulphur No. 1	lb.	.50 @	—
No. 2	lb.	.18 @	.25
Thiocarbanilid, drums	lb.	.24 @	.30
Thiurad	lb.	— @	2.35
Trimene	lb.	.55 @	.65
base	lb.	1.05 @	1.20
Triphenylguanidine	lb.	.45 @	—
Tuads	lb.	2.35 @	—
Ulto	lb.	1.50 @	1.75
Ureka	lb.	.60 @	.75
Ureka Blend B	lb.	.60 @	.75
Ureka C	lb.	.56 @	.65
Vulcanex	lb.	.42 @	.43
Vulcanol	lb.	.85 @	—
Zimate	lb.	2.35 @	—
Inorganic			
Litharge, domestic	lb.	.07 @	.07½
Magnesia, calcined, heavy	lb.	.04 @	—

COLORS

Blacks (See Compounding Materials)

Blues			
Prussian	lb.	.36 @	.37
Ultramarine	lb.	.15 @	—
Browns			
Mapico	lb.	.13 @	—
Umber, Turkey	lb	.04 @	.04½
Greens			
Chrome	lb.	.21 @	—
Chromium Oxide, bbl.	lb.	.21 @	—
Guignet's Green	lb.	.°0 @	—
Reds			
Antimony crimson, 15/17	lb.	.45 @	—
sulfur, free	lb.	.48 @	.60
Indian English	lb.	.09 @	.10
Domestic (Maroon)	lb.	.11 @	—
Red oxide, pure	lb.	.10 @	.12
Rub-Er-Red, f.o.b. Easton	lb.	.09¼ @	—
Whites			
Cryptone, No. 19	lb.	.05¼ @	.05½
Cryptone CB, No. 21	lb.	.05¼ @	.05½
Cryptone, ZS-230	lb.	.07½ @	.07¾
Cryptone, ZS-86	lb.	.07½ @	.07¾
Lithopone			
Albalith, black label—11	lb.	.03¼ @	.04
Azolith	lb.	.03¼ @	.04
Ray-bar	lb.	.05¼ @	.05¼
Ray-cal	lb.	.05¼ @	.05¼
Ravox	lb.	.13 @	.14
Titanox A	lb.	.13 @	.14
Titanox B	lb.	.05¼ @	.05¼
Titanox C	lb.	.05 @	.05½
Zinc Oxide—American Process			
American Azo: ZZZ (lead free)	lb.	.06¼ @	.06½
Anaconda, lead free	lb.	.06¼ @	.06½
Horsehead Lead Free Brand:			
Special—3	lb.	.06¼ @	.06½
XX Red—4	lb.	.06¼ @	.06½
XX Red—72	lb.	.06¼ @	.06½
XX Red—78	lb.	.06¼ @	.06½
XX Red—103	lb.	.06¼ @	.06½
Kadox, black label—15	lb.	.06½ @	.06¾
Blue label—16	lb.	.06½ @	.06¾
Red label—17	lb.	.06½ @	.06¾
St. Joe, black label	lb.	.06¼ @	.06½
green label	lb.	.06¼ @	.06½
red label	lb.	.06¼ @	.06½
U. S. P.—7. bbls.	lb.	.09½ @	.09¾
Zinc Oxide—French Process			
Florence White seal—7 bbls.	lb.	.08½ @	.08¾
Green seal—8	lb.	.08 @	.08¼
Red seal—9	lb.	.07½ @	.07¾
Yellows			
Cadmolith	lb.	.55 @	.65
Chrome	lb.	.14½ @	.15½
Mapico	lb.	.09½ @	—

BLACKS *

(In bags, carload lots)

Aerfloted Arrow	lb.	.0265 @	—
Certified	lb.	.0265 @	—
Certified Spheron	lb.	.0265 @	—
Continental	lb.	.0265 @	—
Disperso	lb.	.0265 @	—
Excello	lb.	.0265 @	—
Fumonex	lb.	.03 @	—
Fumonex Beads	lb.	.03 @	—
Gastex	lb.	.03 @	—
Kosmobile	lb.	.0265 @	—
Kosmobile 66	lb.	.0265 @	—
Micronex (Amarillo)	lb.	.0265 @	—
Micronex Beads (Amarillo)	lb.	.0265 @	—
Pelletex	lb.	.03 @	—
P-33	lb.	.0475 @	—
Supreme	lb.	.0265 @	—
Thermax	lb.	.02 @	—
Wyex	lb.	.0265 @	—

COMPOUNDING MATERIALS

Aluminum Flake	ton	21.85 @	24.50
Ammonia carbonate, lump	lb.	.10¼ @	.12
Asbestine	ton	13.00 @	15.00
Barium carbonate (98-100%)	ton	— @	—
Barium Dust	lb.	.05 @	.06
Barytes	ton	23.65 @	31.15
Bentonite	lb.	.02 @	.03
Blanc fixe dry f.o.b. works	ton	60.00 @	65.00
Calcene	ton	37.50 @	45.00
Cataipo (fact.)	lb.	.02 @	—
Chalk, precipitated			
Suprex white, extra lt.	ton	45.40 @	60.00
heavy	ton	45.00 @	55.00
Clay, Kaolin, domestic	ton	9.50 @	—
Aerfloated, Suprex	ton	10.00 @	22.00
Crown (f.o.b. plant)	ton	10.00 @	—
Dixie	ton	10.00 @	24.50
McNamee	ton	10.00 @	22.50
Par	ton	10.00 @	22.50
Witco	ton	10.00 @	—
Cotton Flock (Dark)	lb.	.10½ @	.13
Glues, extra white	lb.	.28 @	.30
medium white	lb.	.14 @	19
Kalite No. 1	ton	24.00 @	50.00
Kalite No. 3	ton	34.00 @	60.00
"Lime Crest" Industrial Filler No. 100	lb.	— @	—
Magnesium carbonate	lb.	.07½ @	—
Mica	ton	35.00 @	44.00
Mineralite	ton	— @	30.00
Pyrax A	ton	6.00 @	20.00
Rottenstone (powdered)	lb.	.02½ @	.03
Soapstone, powdered	ton	16.00 @	22.00
Starch, powdered	cwt.	2.90 @	4.10
Talc, domestic	ton	25.00 @	45.00
Whiting, commercial	ton	17.00 @	18.00
Columbia Filler	ton	9.00 @	14.00
English Cliffstone	ton	33.00 @	43.00
Witco	ton	6.00 @	—
Wood Flour	ton	20.00 @	25.00
Zinc Carbonate	lb.	— @	—
Zinc Stearate	lb.	— @	—

MINERAL RUBBER

285°-300° Mineral Rubber	ton	21.00 @	42.00
Black Diamond	ton	25.00 @	—
Genasco, solid (factory)	ton	25.00 @	27.00
Hard Hydrocarbon	ton	21.00 @	42.00
Parmr, solid	ton	21.00 @	27.00
Pioneer, MR, solid	ton		
Pioneer-granulated	ton		

MISCELLANEOUS

Aromatics—Rodo #0	lb.	3.50 @	4.00
Rodo #10	lb.	4.50 @	5.00
Curodex 19	lb.	2.75 @	—
Curodex 188	lb.	3.50 @	—
Curodex 198	lb.	4.50 @	—
Para-Dor No. 5145	lb.	2.00 @	—
Aresklene No. 375 (dispersing, wetting and penetrating agent)	lb.	.35 @	.50
Darvan (dispersing agent)	lb.	.30 @	.47
Santomerse S (dispersing, wetting, penetrating and stabilizing agent)	lb.	.11 @	.25
Sunproof	lb.	.20 @	.25
Sponge Paste	lb.	— @	.18
Tackol (tackifier)	lb.	.085 @	.18
Tonox	lb.	.52 @	.61

SOFTENERS

Acids			
Acetic, 28%, bbls.	100 lb.	2.53 @	2.78
Nitric, 36 degrees	cwt.	5.00 @	6.00
Sulfuric, 66 degrees	ton	15.50 @	16.50
Acids, Fatty			
Laurex	lb.	.11¼ @	.13¾
SL #10	lb.	.12 @	.14
Stearex Beads	lb.	.08 @	.09
Stearic, double pressed	lb.	.12½ @	.13½
Stearite	lb.	.10½ @	—
Alkalies			
Caustic Soda, 76%	cwt.	2.70 @	3.55
Soda Ash, 58%, C.L.	cwt.	— @	2.35
Oils			
Cycline Oil	gal.	.14 @	.20
Degras, bbls.	lb.	.07¾ @	.08
Fluxrite	lb.	.05½ @	.06¼
Palm Niger	lb.	.05½ @	.06¼
Para-Flux	gal.	.17 @	.18
Para Lube	lb.	— @	.05
Petrolatum, light	lb.	.03½ @	.03¾
Pigmentaroil, tank cars	gal.	.16 @	—
in drums	gal.	.22½ @	.23¾
Pine, steam distilled	gal.	.64 @	.69
Rosin Oil, cmpd	gal.	.40 @	—
Rubberol, f.o.b. Chicago	lb.	.13½ @	.14
Rubtack	lb.	.08 @	.10
Seedine, c.l.	lb.	.07¼ @	—
Tackol	lb.	.08½ @	.18
Witco Palm Oil	lb.	.07 @	—
Witco Softener No. 20	gal.	.20 @	—
Woburn No. 8, c.l.	lb.	.06 @	—
Wobonite, c.l.	lb.	.05 @	—
Resins and Pitches			
Pitch, Burgundy	lb.	.05½ @	.06¼
coal tar	ton	19.00 @	22.00
hardwood	ton	16.00 @	22.50
pine, 200 lb. gr. wt.	bbl.	6.00 @	6.50
Pigmentar, tank cars	gal.	.16 @	—
in drums	gal.	.22½ @	.23½
R. S. L. Resin	lb.	— @	—
Retort Pine Tar, drums	ton	20.00 @	26.00
Solvents			
Acetone, pure	lb.	— @	—
Alcohol, denatured, methanol, No. 1 bbls.	gal.	.33 @	.39
Benzene, 90%	gal.	.18 @	.23
Beta-Trichlorethane	gal.	— @	.20
Bondogen	lb.	.98 @	1.50
Carbon, bisulfide	lb.	.05¼ @	.08
Carbon tetrachloride	gal.	.73 @	1.065
Dichlorethylene	lb.	— @	—
Dipentene, cml., drums	gal	.41 @	.50
Ethylene dichloride	lb.	.06 @	.07
Plastogen	lb.	.07¼ @	.12
Reogen (drums)	lb.	.11½ @	.26
Rub-Sol (f.o.b. Okla.)	gal.	.09 @	—
Trichlorethylene	lb.	— @	.08½
Turpentine, spirits	gal.	.43 @	.47
dest. dist., drums	gal.	.33 @	.41
Waxes			
Beeswax, white	lb.	.39 @	.45
Carnauba, yellow	lb.	.46 @	.47½
Ceresin, white, dom.	lb.	.08 @	.11
Montan, crude	lb.	.10¼ @	.11¾
Paraffin (c.l.—f.o.b. N. Y.)			
Yellow crude scale	lb.	.02¾ @	—
White crude scale 124/126	lb.	.02¾ @	.03
Refined, 122/127	lb.	.04½ @	—

ANTI-OXIDANTS

Agerite Alba	lb.	1.50 @	1.95
Exel	lb.	1.00 @	1.40
Gel	lb.	.57 @	.73
Hipar	lb.	.65 @	.92
Powder	lb.	.52 @	.64
Resin	lb.	.52 @	.64
Resin D	lb.	.52 @	.64
White	lb.	1.25 @	1.60
Albasan	lb.	.70 @	.75
Antox	lb.	— @	.56
B-L-E	lb.	.52 @	.61
Flectol B	lb.	.52 @	.65
Flectol H	lb.	.52 @	.65
Flectol White	lb.	.90 @	1.15
Neozone	lb.	.52 @	.63
Oxynone	lb.	.64 @	.80
Retardex	lb.	.35 @	.40
Santoflex B	lb.	.52 @	.65
Santovar A	lb.	1.15 @	1.40
S.C.R.	lb.	.33 @	.35
Stabilite	lb.	.52 @	.54
Stabilite Alba	lb.	.70 @	.75
VGB	lb.	.52 @	.61

MOLD LUBRICANTS

Aresklene	lb.	.35 @	.50
Cocoa Soapstock	lb.	.06 @	.08
Dipex	lb.	.06 @	.08
Lubrex	lb.	.25 @	.30
Mineralite	ton	— @	30.00
Mold Paste	lb.	.12 @	.18
Rubberol, f.o.b. Chicago	lb.	.13½ @	.14
Rusco, f.o.b. Nitro	lb.	.12 @	.30
Sericite, f.o.b. N. Y.	ton	65.00 @	—
Soap Tree Bark, cut, sifted	lb.	.06 @	.08

FACTICE OR RUBBER SUBSTITUTES

Amberex	lb.	.17 @	—
Black	lb.	.08 @	.12
White	lb.	.08½ @	.12
Brown	lb.	.08 @	.10½
Neophax	lb.	.09¼ @	—

VULCANIZING INGREDIENTS

Dispersed Sulfur No. 2	lb.	.07½ @	.15
Sulfur Chloride, yellow (drs.)	lb.	.04 @	—
Sulfur flour,			
Refined, 100% pure (bags)	cwt.	2.50 @	3.65
Commercial (bags)	cwt.	1.60 @	2.35
Telloy	lb.	1.75 @	—
Vandex	lb.	1.75 @	—

* New carbon black prices effective April 1.

Crude Rubber
Latex and Guayule
Reclaimed Rubber
Tires and Tubes

STATISTICS OF THE INDUSTRY

Rim Production
Automobiles
Gasoline
Cotton Prices

U. S. Imports and Exports of Crude Rubber

YEARS	Gross Imports: Long Tons	Gross Imports: Total Declared Value	Gross Imports: Average Declared Value per pound Cents	Re-exports: Long Tons	Re-exports: Total Declared Value	Re-exports: Average Declared Value per pound Cents	Net Imports: Long Tons
1924	325,899	173,367,272	23.75	10,309	6,057,637	26.23	315,590
1925	393,370	426,167,504	48.36	14,827	19,847,753	59.76	378,543
1926	409,944	501,131,064	54.57	17,671	22,470,583	56.77	392,273
1927	424,733	338,688,492	35.60	27,775	24,735,488	39.76	396,958
1928	432,633	242,727,423	25.05	32,159	18,128,761	25.17	400,474
1929	560,082	239,177,811	19.06	36,485	16,868,718	20.64	523,597
1930	482,083	139,133,048	12.88	30,205	9,310,205	13.76	451,878
1931	497,176	72,922,845	6.55	25,595	4,255,572	7.42	471,581
1932	409,556	31,936,459	3.48	20,930	2,015,612	4.30	388,626
1933	407,817	44,034,064	4.82	20,537	2,601,352	5.65	387,280
1934	449,513	97,929,676	9.73	23,848	5,770,109	10.80	425,665
1935	453,134	115,299,448	11.36	11,389	3,084,331	12.09	441,745
1936	467,064	152,072,496	14.54	12,581	4,488,223	15.93	454,483
1937	574,600	237,307,041	18.44	7,902	3,385,433	19.02	566,698
1938	397,620	125,357,730	14.07	5,652	1,799,124	14.21	391,968
1939	469,803	167,558,245	15.92	13,125	5,832,618	19.84	456,678
1938:							
Dec.	36,031	12,601,926	15.61	424	141,364	14.87	35,607
1939							
Jan.	35,255	12,313,006	15.59	468	165,663	15.79	34,787
Feb.	29,109	10,269,224	15.75	460	152,113	14.76	28,649
Mar.	43,490	15,058,279	15.46	439	171,279	17.43	43,051
Apr.	30,836	10,400,125	15.06	440	151,644	15.38	30,396
May	42,998	15,041,433	15.62	496	180,091	16.20	42,502
June	32,437	11,403,150	15.69	413	147,910	16.00	32,024
July	34,288	12,071,105	15.72	440	164,428	16.69	33,848
Aug.	35,794	12,702,958	15.84	267	89,741	15.01	35,527
Sept.	35,006	12,667,740	16.16	1,472	659,055	19.98	33,534
Oct.	42,784	15,211,621	15.87	5,886	2,881,172	21.85	36,898
Nov.	39,422	14,555,150	16.48	1,228	539,763	19.63	38,194
Dec.	68,384	25,861,354	16.88	1,116	529,759	21.20	67,268

Note: "Gross Imports" do not include latex or guayule. To secure more accurate figures for "Net Imports" latex and guayule figures (shown below) should be added and the re-export figure deducted from the total. Annual figures for 1922, however, include both latex and guayule; guayule only is included in 1923. Annual figures for 1922-36 were revised in February, 1937.

United States Imports of Guayule, Balata, Jelutong, Liquid Latex

(All Quantities in Long Tons)

	Guayule: Tons	Guayule: Dollars	Balata: Tons	Balata: Dollars	Jelutong: Tons	Jelutong: Dollars	Liquid Latex (1): Tons	Liquid Latex (1): Dollars
1924	1,356	536,392	464	568,456	6,165	1,237,100	2,157	864,059
1925	3,781	1,803,448	517	574,750	6,749	1,642,531	3,272	3,537,510
1926	4,305	2,562,096	354	327,213	7,263	3,127,757	3,394	4,686,743
1927	5,018	2,674,957	582	477,246	7,785	2,448,657	1,495	1,170,650
1928	3,077	1,755,685	731	430,855	7,552	2,540,059	4,007	2,121,786
1929	1,275	545,175	728	566,964	8,204	2,458,126	3,729	1,788,391
1930	1,096	347,388	502	422,684	5,907	1,403,244	4,458	1,508,786
1931	....	.....	1,207	411,380	5,777	1,019,010	4,675	888,909
1932	....	.....	707	147,403	4,607	616,596	5,112	601,999
1933	....	.....	1,659	2,261,869	5,990	944,895	11,085	1,833,671
1934	398	75,349	1,054	438,209	4,987	943,752	13,107	3,643,221
1935	459	86,835	615	188,384	5,644	1,063,126	13,553	3,782,222
1936	1,229	286,552	535	199,368	6,163	1,296,364	19,852	6,659,899
1937	2,694	745,873	354	151,344	7,109	2,017,786	23,185	10,213,670
1938	2,485	623,819	509	181,140	9,132	2,944,504	11,878	4,147,318
1939	2,232	463,345	694	265,553	6,640	1,603,418	27,438	10,467,552
1938:								
Dec.	181	39,869	13	6,263	917	237,653	1,263	479,966
1939:								
Jan.	226	49,580	61	20,417	843	203,753	1,602	599,927
Feb.	212	46,576	15	4,426	510	129,726	1,717	657,565
Mar.	229	39,520	14	5,215	641	136,112	2,005	731,302
Apr.	180	24,584	59	18,170	281	72,024	1,018	360,739
May	102	22,347	56	16,359	645	161,745	2,786	1,067,682
June	91	19,879	119	33,876	597	122,087	1,836	694,863
July	150	32,626	39	18,813	663	141,540	2,934	1,064,927
Aug.	178	38,687	28	8,689	742	208,156	2,614	1,001,013
Sept.	133	30,091	36	19,682	479	100,285	2,525	965,615
Oct.	282	61,376	107	43,267	465	127,084	2,555	968,207
Nov.	214	46,558	96	37,858	289	74,358	3,071	1,227,788
Dec.	236	51,521	64	38,781	477	126,548	2,779	1,127,924

(1) Weight given in pounds of dry rubber contained in latex.
Note: Annual figures for 1924-1936 revised on basis of information received on February 8, 1937.

U. S. Consumption of Crude Rubber

(Rubber Manufacturers' Association statistics raised to 100 per cent—All figures in long tons)

Figures on Monthly Basis

	1933	1934	1935	1936	1937	1938	1939	1940
Jan.	22,645	39,190	46,636	48,631	50,879	31,265	46,234	54,978
Feb.	21,392	40,515	42,720	36,841	51,950	25,357	42,365	.....
Mar.	17,843	47,003	42,153	42,813	54,129	32,389	50,165	.....
Apr.	25,928	44,853	44,247	52,031	51,859	29,730	44,166	.....
May	44,074	42,918	41,101	50,612	51,795	30,753	44,377	.....
June	50,743	40,147	36,156	52,772	51,860	32,540	47,259	.....
July	49,614	32,553	35,917	48,250	43,703	34,219	43,880	.....
Aug.	44,428	33,216	38,775	46,777	41,506	40,552	50,481	.....
Sept.	35,281	30,258	37,086	46,449	43,945	40,183	50,150	.....
Oct.	31,543	31,253	41,969	49,637	38,754	42,850	55,764	.....
Nov.	28,831	34,748	42,310	50,433	34,025	49,050	54,322	.....
Dec.	28,757	36,569	42,474	49,754	29,195	48,143	48,428	.....
Tot.	401,079	453,223	491,544	575,000	543,600	437,031	577,591	.....

* Revised.
Note: All figures are now based on Department of Commerce survey figures.

Reclaimed Rubber in the United States

(All Quantities in Long Tons)

Year	Production	Consumption: Tons	Consumption: % to Crude	Stocks[a]	Year	Production	Consumption: Tons	Consumption: % to Crude	Stocks[a]
1930	157,967	153,497	40.8	22,000	1935	122,948	113,078	23.0	25,069
1931	133,351	124,126	33.9	19,257	1936	150,571	141,486	24.6	19,000
1932	75,608	77,504	23.4	16,354	1937	185,033	162,000	29.8	28,800
1933	99,560	81,602	19.9	20,746	1938	122,403	120,800	27.6	23,000
1934	110,010	100,597	22.2	23,079	1939	198,815	184,942	32.0	25,427

Figures on Monthly Basis

	Production	Tons	% to Crude	Stocks[a]		Production	Tons	% to Crude	Stocks[a]
1939:*									
Jan.	14,826	13,743	29.7	23,334	July	12,588	13,542	30.9	21,339
Feb.	14,102	13,347	31.5	23,461	Aug.	17,595	16,846	33.4	21,024
Mar.	15,647	16,197	32.3	22,155	Sept.	17,990	16,953	33.8	21,185
Apr.	14,527	13,391	30.3	22,628	Oct.	20,896	18,955	34.0	21,829
May	14,769	13,517	30.5	22,771	Nov.	20,755	18,006	33.2	22,362
June	15,871	14,870	31.4	23,058	Dec.	19,249	15,575	32.2	25,427
1940									
Jan.	20,447	17,596	32.0	25,530	July	.....	.....	...	.....
Feb.	.....	.....	...	.....	Aug.	.....	.....	...	.....
Mar.	.....	.....	...	.....	Sept.	.....	.....	...	.....
Apr.	.....	.....	...	.....	Oct.	.....	.....	...	.....
May	.....	.....	...	.....	Nov.	.....	.....	...	.....
June	.....	.....	...	.....	Dec.	.....	.....	...	.....

[a] Stocks on hand at the end of month or year.
* Revised.
Note: Figures for 1938 were revised on June 1, 1939, and are now based on Department of Commerce survey figures.

U. S. Consumption of Gasoline

(Bureau of Mines Statistics)
(In Thousands of Barrels of 42 Gallons)

	1937*	1938*	1939		1937*	1938*	1939
January	33,668	35,323	37,767*	August	49,598	50,549	53,828*
February	32,034	31,981	34,595	September	47,515	46,150	49,347
March	40,524	41,409	42,520	October	45,446	46,365	49,687
April	43,461	43,430	43,977	November	42,718	45,084	47,275
May	45,407	44,937	49,547	December	39,465	41,742	43,694
June	48,447	48,383	49,812				
July	51,069	47,650	50,508	Total	519,352	523,003	552,557*

* Revised.

Rims Inspected and Passed in U. S.

(Tire and Rim Association Reports)

	Total		Total		Total
1928	24,247,282	1932	6,261,336	1936	20,790,192
1929	24,141,502	1933	8,713,962	1937	22,257,964
1930	17,364,096	1934	12,255,119	1938	10,612,138
1931	11,253,800	1935	18,664,356	1939	17,471,914

1940		1940		1940	
January ...	2,163,914	May	.....	September ..	.....
February ..	1,850,383	June	.....	October ...	.....
March	.....	July	.....	November ..	.....
April	.....	August	.....	December ..	.....

Daily Spot Closing Prices of Ribbed Smoked Sheet Rubber—*New York Market, in Cents per Pound*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Ave.
1937																																
Dec.	15	15⅜	15½	15⅝	—	15⅞	15¾	15¾	15⅞	15½	15¾	—	15⅞	15	15	15⅜	15⅞	15⅞	—	15	15⅞	15⅞	15⅞	15⅝	—	—	15	14⅞	14½	14⅞	14⅞	15⅜
1938																																
Jan.	—	14⅞	14⅞	14⅞	14⅝	14⅜	14⅜	14⅜	—	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	—	14⅜	14⅜
Feb.	14⅞	14⅞	14⅞	14⅞	14⅝	14⅜	—	—	14⅜	14⅜	14⅜	14⅜	—	14⅜	14⅜	14⅜	—	14⅜	14⅜	—	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	—	14⅜	14⅜	14⅜	14⅜	14 7/16
Mar.	14⅞	14⅞	14⅞	14⅝	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14	14	14	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜
April	10⅞	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	12	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	10⅝	11⅝	11⅝
May	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	12	12	12⅛	12	12	12	11⅞	12	12	11⅞	11⅞	12	12	12	12	12	11⅞	11⅞	11⅞	11⅞	11⅝	—	11⅝
June	11⅝	11⅝	11⅝	—	11⅝	11⅝	11⅝	11⅝	12	12	12	12⅛	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
July	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝	11⅝
August	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛
Sept.	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝
Oct.	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛
Nov.	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛
Dec.	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞
1939																																
Jan.	—	15⅝	15⅝	16⅛	16	16	—	—	15⅛	16	15⅛	15⅝	15⅛	15⅛	15⅛	15⅝	15⅛	15⅛	15⅛	15⅞	15⅝	—	15⅞	15⅝	15⅝	14⅞	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛
Feb.	15⅝	15⅝	15⅝	15⅝	—	15⅛	15⅛	15⅛	15⅛	15½	15½	—	15⅛	15⅛	15⅛	16⅛	16⅛	16⅛	15⅝	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	—	—	16
March	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛
April	15⅞	15⅞	16	15⅞	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
May	16⅛	16⅛	16	15⅞	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
June	16⅛	16⅛	16	15⅞	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
July	16⅝	16⅝	16⅝	—	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝
August	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞
September	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞
October	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
November	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛
December	20	20	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1940																																
January	—	19⅛	19⅛	19⅛	19⅛	19⅛	—	19⅜	19⅛	19¾	19½	19⅝	—	19⅛	19⅛	19¼	19¼	19⅛	19⅛	19	—	19⅛	—	18⅞	18⅞	18¾	—	—	18⅞	18⅞	—	19
February	18¾	18¾	18¾	18½	18¾	18¾	18¾	18⅝	18⅛	18¾	—	—	18¾	—	—	—	19⅛	19⅛	—	18⅞	18⅞	—	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	—	18⅞
March	18⅞	18⅞	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Average Spot Closing Prices—Ribbed Smoked Sheets

(New York Markets)

Average Price per Pound for Years 1913-1932

Year	Cents	Year	Cents	Year	Cents	Year	Cents	Year	Cents
1913	82.04	1917	72.23	1921	16.36	1925	72.46	1929	20.59
1914	65.33	1918	60.15	1922	17.50	1926	48.50	1930	11.98
1915	65.85	1919	48.70	1923	29.45	1927	37.72	1931	6.17
1916	72.50	1920	36.30	1924	26.20	1928	22.48	1932	3.49

Average Monthly Price per Pound Since 1933

	1933 Cents	1934 Cents	1935 Cents	1936 Cents	1937 Cents	1938 Cents	1939 Cents	1940 Cents
Jan.	3.08	9.32	13.10	14.35	21.37	14.63	15.75	19.06
Feb.	2.95	10.45	12.92	15.48	21.33	14.71	15.93	18.83
Mar.	3.01	11.01	11.51	15.89	24.09	13.55	16.26	
Apr.	3.56	12.10	11.55	15.98	23.44	11.84	15.87	
May	4.95	13.26	12.05	15.62	21.14	11.57	16.07	
June	6.15	13.51	12.57	15.85	19.39	12.57	16.37	
July	8.01	14.60	12.10	16.49	18.86	15.37	16.51	
Aug.	7.31	15.47	11.98	16.25	18.37	16.08	16.67	
Sept.	7.30	15.36	11.55	16.46	18.55	16.15	21.24	
Oct.	7.64	13.96	12.62	16.55	16.28	16.89	19.89	
Nov.	8.66	13.04	13.15	17.97	14.60	16.24	20.21	
Dec.	8.87	12.98	13.28	20.01	15.41	16.05	20.01	
Average for Year	5.96	12.92	12.37	16.41	19.39	14.64	17.57	

London Closing Prices of Ribbed Smoked Sheets

(In Pence Per Pound)

Day	1939 Dec.	1940 Jan.	1940 Feb.	1940 Mar.	Day	1939 Dec.	1940 Jan.	1940 Feb.	1940 Mar.
1	11⅜	—	11⅜	12 7/16	17	—	11⅝	—	
2	—	11⅝	11⅜	—	18	11⅜	11⅜	—	
3	—	11⅝	—	—	19	11⅞	11⅞	13¼	
4	11⅞	11⅝	—	12⅜	20	11⅜	—	13⅜	
5	11¾	11⅝	11⅜	12¼	21	11⅝	—	12⅜	
6	11⅝	—	11⅜	12¼	22	11⅝	12⅛	12¼	
7	10⅜	—	12⅛	12¾	23	—	11⅞	12¾	
8	11⅝	11⅝	12⅝	12⅜	24	—	11⅛	—	
9	—	11¾	12⅞	—	25	—	11⅞	—	
10	—	11⅜	—	—	26	—	11⅜	13⅛	
11	11½	11⅜	—	12⅛	27	11⅛	—	12⅜	
12	11⅞	11⅛	12⅞		28	11⅝	—	12⅝	
13	12	—	12⅛		29	11¾	11⅛	12⅞	
14	11⅜	—	12¾		30	—	11⅜	—	
15	11⅞	11⅝	13⅛		31	—	11⅛	—	
16	—	11⅛	13						

Average Monthly Price Per Pound

Month	1937 Pence	1938 Pence	1939 Pence	1940 Pence	Month	1937 Pence	1938 Pence	1939 Pence	1940 Pence
Jan.	10.378	7.077	7.926	11.793	Aug.	8.830	7.841	8.545	
Feb.	10.503	7.029	7.942	12.577	Sept.	8.935	7.918	9.634	
Mar.	11.766	6.590	8.120		Oct.	7.855	8.355	10.177	
Apr.	11.471	5.793	7.910		Nov.	7.080	8.111	11.210	
May	10.250	5.632	8.002		Dec.	7.332	8.005	11.559	
June	9.548	6.147	8.216		Average for Year.	9.424	7.164	8.959	
July	9.136	7.464	8.271						

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market)

Recent Daily Price Per Pound

Date	1940 Jan.	1940 Feb.	1940 Mar.	Date	1940 Jan.	1940 Feb.	1940 Mar.	Date	1940 Jan.	1940 Feb.	1940 Mar.
1	—	10.89	11.07	11	11.26	—	10.97	22	11.04	—	
2	11.54	10.87	10.95	12	11.21	—		23	10.67	11.22	
3	11.63	10.81	—	13	11.15	11.01		24	10.89	11.28	
4	11.40	—	11.08	14	—	11.11		25	10.89	—	
5	11.29	10.89	11.12	15	11.31	11.09		26	10.91	11.33	
6	11.46	10.98	11.03	16	11.25	11.14		27	10.90	11.26	
7	—	11.02	11.08	17	11.50	11.18		28	—	11.23	
8	11.46	11.02	11.08	18	11.31	—		29	10.75	11.20	
9	11.43	11.12	11.03	19	11.44	11.18		30	10.82	—	
10	11.45	11.17	—	20	11.24	11.19		31	10.79	—	
				21	—	11.18					

Average Monthly Price Per Pound

	1937 Cents	1938 Cents	1939 Cents	1940 Cents		1937 Cents	1938 Cents	1939 Cents	1940 Cents
Jan.	13.06	8.57	8.94	11.19	Aug.	10.41	8.41	9.30	
Feb.	13.15	8.91	8.97	11.10	Sept.	9.02	8.17	9.30	
Mar.	14.46	8.92	9.00		Oct.	8.42	8.61	9.24	
Apr.	14.23	8.76	8.87		Nov.	7.96	9.08	9.73	
May	13.34	8.50	9.56		Dec.	8.26	8.72	10.97	
June	12.70	8.38	9.88		Average for Year	11.44	8.66	9.46	
July	12.26	8.85	9.71						

Stocks of Crude Rubber

(All figures are in long tons)

ON HAND OR AFLOAT TO THE U. S.

End of:	ON HAND 1938	1939	1940	AFLOAT 1938	1939	1940	ON HAND AND AFLOAT 1938	1939	1940
Jan.	276,497	223,879	156,830	57,356	48,210	90,285	333,853	272,089	247,115
Feb.	292,067	217,534		47,459	55,814		339,526	273,348	
Mar.	301,762	205,936		41,882	55,981		343,644	261,917	
Apr.	303,901	190,896		39,071	57,918		342,972	248,814	
May	300,907	193,602		32,859	54,046		333,766	247,648	
June	294,796	181,794		32,079	51,274		326,875	233,068	
July	282,785	174,240		40,400	52,990		323,185	227,230	
Aug.	273,841	161,362		47,772	66,717		321,613	228,079	
Sept.	268,094	150,171		48,927	68,310		317,021	218,481	
Oct.	259,074	133,183		51,062	100,500		310,136	233,683	
Nov.	242,592	118,535		51,114	114,044		293,706	232,579	
Dec.	231,500	140,280		45,105	91,095		276,605	231,375	

STOCKS IN GREAT BRITAIN

(No. of Tons in Wharves and Warehouses, not including Latex)

At end of	London 1938	1939	1940	Liverpool 1938	1939	1940
January	40,203	51,420	12,000*	21,711	28,789	8,000*
February	46,596	48,312		24,737	26,784	
March	50,233	46,768		26,220	24,996	
April	54,296	44,760		28,277	23,742	
May	57,194	43,454		29,862	22,211	
June	60,307	42,374		31,837	21,176	
July	62,236	37,772		32,825	19,116	
August	65,113	28,363		34,315	16,218	
September	63,321	24,965*		34,645	14,054*	
October	59,609	23,685*		33,483	13,336*	
November	57,794	23,244*		32,116	13,087*	
December	55,668	19,545*		31,012	11,006*	

* Estimated.

(Figures up to August, 1939, from the Rubber Trade Association of London)

STOCKS IN OTHER CENTRES

(Figures from Statistical Bulletin of the Int'l Rubber Regulation Committee)

	Penang and Singapore [1]	Malaya [2]	Ceylon [2]	Holland	Para and Manaos
At end of 1938					
December	27,084	57,860	6,120	268	1,864
At end of 1939					
January	30,975	59,155	4,827	198	1,557
February	28,559	59,399	4,318	183	1,826
March	23,255	58,005	3,389	137	2,244*
April	22,434	55,238	3,648	131	2,209
May	20,849	52,837*	4,005	136	1,966
June	19,563*	55,834	3,771	101	1,821
July	27,042	55,948	4,217	188	1,474
August	20,543*	50,625	3,134	315	1,914
September	23,457*	52,755	2,742	...	2,682
October	25,398	46,264	3,335	...	3,419
November	23,006	45,133	5,289	...	4,510

[1] Dealers' and Port Stocks. [2] Inside Regulated Areas. [3] Dealers' Stocks Only.
* Revised.

RUBBER STOCKS AFLOAT

End of:	Afloat for United States	Afloat for Europe	All Other * Afloat	Total * Afloat
1939				
January	48,210	27,900	28,890	105,000
February	55,814	28,300	21,886	106,000
March	55,981	25,200	20,819	102,000
April	57,918	27,200	13,882	99,000
May	54,046	25,700	16,254	96,000
June	51,274	25,260	11,466	88 000
July	52,990	31,000	21,010	105,000
August	66,717	30,000	23,283	120,000
September	68,310	30,000	35,690	134,000
October	100,500	35,000	37,500	173,000
November	114,044	35,000	21,956	171,000
December	91,095	35,000	25,905	152,000
End of: 1940				
January	90,285	54,715	30,000	175,000

* *Total Afloat* is an arbitrary estimate based on 1½ months' shipments as adopted by the Department of Commerce. *All Other Afloat* is determined by subtracting the amount of stocks in transit to the United States and Europe from the estimated total.

TOTAL PRINCIPAL WORLD STOCKS

(Figures from the Survey of Current Business)

At End of:	1934	1935	1936	1937*	1938*	1939
January	661,948	698,153	600,479	454,249	549,762	497,665
February	663,308	686,195	599,355	445,265	565,833	479,578
March	666,382	678,809	583,318	447,856	586,666	460,723
April	658,796	677,006	567,172	428,249	586,291	438,252
May	689,239	677,569	541,871	413,134	568,158	429,979
June	672,804	671,525	520,255	434,250	573,136	407,640
July	676,200	679,061	519,074	445,782	580,654	418,639
August	674,702	680,644	500,520	457,462	565,394	397,345
September	694,361	661,509	493,585	470,768	551,447	396,867
October	680,616	655,000	486,159	479,398	540,976	413,274*
November	684,408	617,300	466,491	493,266	512,196	395,217
December	705,975	613,987	466,576	545,533	482,852	391,125
Monthly Avge.	677,395	666,397	528,738	460,022	555,280	427,192

* Revised.

U. S. Tire and Tube Statistics[1]

(All Figures Represent Thousands)

AUTOMOBILE CASINGS

Production Figures on Quarterly Basis								
Quarter	1932	1933	1934	1935	1936*	1937*	1938*	1939
Jan.-Mar.	11,004	6,635	13,437	13,355	11,376	15,565	7,314	13,702*
Apr.-June	12,980	14,412	13,565	12,597	14,892	15,834	7,380	13,490*
July-Sept.	9,245	14,707	9,822	11,312	14,914	12,207	10,794	15,109*
Oct.-Dec.	6,856	9,550	10,406	12,099	14,858	9,704	12,360	14,777
Total	40,085	45,304	47,230	49,363	56,040	53,310	37,848	57,078

Shipment Figures on Quarterly Basis								
Quarter	1932	1933	1934	1935	1936*	1937*	1938*	1939
Jan.-Mar.	8,760	6,981	10,730	11,154	10,554	14,143	7,388	12,150*
Apr.-June	18,021	15,139	14,998	13,473	15,940	15,741	9,564	14,908*
July-Sept.	8,141	13,707	11,648	13,489	14,037	13,106	11,243	15,745*
Oct.-Dec.	5,329	8,265	9,310	12,066	12,855	10,495	12,098	14,172
Total	40,251	44,092	46,686	50,182	53,386	53,485	40,293	56,975

Inventory Figures [2]								
Quarter	1932	1933	1934	1935	1936*	1937*	1938*	1939
Jan.-Mar.	9,878	7,290	11,651	11,675	8,762	12,004	10,547	10,248*
Apr.-June	4,999	6,615	10,219	10,755	7,556	12,081	8,337	8,909*
July-Sept.	6,096	7,595	8,419	8,288	8,690	11,200	7,859	8,364*
Oct.-Dec.	7,644	8,888	9,455	8,196	10,717	10,383	8,166	8,688

Figures for Recent Months

	PRODUCTION 1938	1939	1940	SHIPMENTS 1938	1939	1940	INVENTORY [2] 1938	1939	1940
Jan.	2,745	4,464	4,977	2,498	4,057	4,277	10,801	8,932	9,389
Feb.	2,195	4,233		2,342	3,640		10,559	9,573	
Mar.	2,728	5,005		2,858	4,453		10,521	10,248	

AUTOMOBILE INNER TUBES

Production Figures on Quarterly Basis								
Quarter	1932	1933	1934	1935	1936*	1937*	1938*	1939
Jan.-Mar.	10,721	6,230	12,823	12,553	11,891	15,831	7,314	12,385*
Apr.-June	11,913	13,001	13,191	11,631	14,624	15,413	7,380	12,067*
July-Sept.	8,286	14,356	10,321	11,270	15,320	12,038	10,794	13,505*
Oct.-Dec.	5,970	9,000	9,891	12,425	15,201	9,092	12,360	13,410
Total	36,890	42,587	46,226	47,879	57,036	52,374	37,848	51,367

Shipment Figures on Quarterly Basis								
Quarter	1932	1933	1934	1935	1936*	1937*	1938*	1939
Jan.-Mar.	8,918	6,539	10,640	11,252	11,367	14,606	7,387	11,371*
Apr.-June	16,271	13,292	14,553	11,928	15,113	15,495	9,564	13,233*
July-Sept.	7,761	13,370	11,545	13,251	15,069	12,901	11,243	13,759*
Oct.-Dec.	4,961	8,189	8,306	11,636	12,874	9,765	12,099	13,395
Total	37,911	41,390	45,044	48,067	54,423	52,767	40,293	51,758

Inventory Figures [2]								
Quarter	1932	1933	1934	1935	1936*	1937*	1938*	1939
Jan.-Mar.	9,448	6,369	10,244	10,406	8,660	11,993	10,547	9,163*
Apr.-June	5,174	6,097	8,795	10,050	8,075	11,833	8,337	8,044*
July-Sept.	5,753	7,008	7,639	7,565	8,595	11,326	7,859	7,846*
Oct.-Dec.	6,749	7,815	9,180	8,231	10,945	10,312	8,166	7,174

Figures for Recent Months

	PRODUCTION 1938	1939	1940	SHIPMENTS 1938	1939	1940	INVENTORY [2] 1938	1939	1940
Jan.	2,516	4,119	4,287	2,527	3,943	3,827	10,582	8,069	7,634
Feb.	2,216	3,733		2,216	3,372		10,579	8,415	
Mar.	2,582	4,533		2,645	4,056		10,547	9,163	

[1] Based on reports received from the Rubber Manufacturers Association.
[2] Held by manufacturers at end of period indicated.
* Revised.

Automobile Production

Year	United States Total	Passenger Cars	Trucks	Canada Total	Passenger Cars	Trucks	Grand Total
1929	5,358,420	4,587,400	771,020	263,295	207,498	55,797	5,621,715
1930	3,355,986	2,814,452	540,534	154,192	125,442	28,750	3,510,178
1931	2,389,730	1,973,090	416,640	82,621	63,477	19,144	2,472,351
1932	1,370,678	1,135,493	235,187	60,816	50,718	10,098	1,431,494
1933	1,920,057	1,573,512	346,545	65,924	53,855	12,069	1,992,126
1934	2,753,111	2,177,919	575,192	116,852	92,647	24,205	2,869,963
1935	3,946,934	3,252,244	694,690	172,877	135,562	37,315	4,119,811
1936	4,454,115	3,669,528	784,587	162,159	128,369	33,790	4,616,274
1937	4,808,974	3,915,889	893,085	207,463	153,046	54,417	5,016,437
1938	2,489,085	2,000,985	488,100	166,086	123,761	42,325	2,655,171
1939*	3,577,292	2,866,796	710,496	155,316	108,806	46,510	3,732,608
1939							
July	209,343	150,738	58,605	9,135	5,112	4,023	218,478
Aug.	99,868	61,384	38,484	3,475	1,068	2,407	103,343
Sept.	188,751	161,625	27,126	3,921	3,494	427	192,672
Oct.*	313,377	251,819	61,558	11,296	7,791	3,505	324,673
Nov.*	351,782	285,252	66,530	16,756	9,882	6,874	368,538
Dec.	452,024	373,755	78,269	16,978	11,491	5,487	469,002
1940							
Jan.	432,101	362,736	69,365	17,213	12,579	4,634	449,314
Feb.	.....	.....	.....	.....	.....	.....	.....
Mar.	.....	.....	.....	.....	.....	.....	.....

* Revised.
Note: U. S. figures represent factory sales; Canadian figures represent production.

Exports of Crude Rubber from Principal Producing Countries

(Long Tons)

	BRITISH MALAYA [1]								NETHERLAND INDIES [4]						
	Gross Exports	Imports	Net Exports	Ceylon [3]	India & Burma [3]	Sarawak [3]	British North Borneo [3]	Thailand [3]	Java & Madura	Sumatra E. Coast	Other N. I.	Indo-China [3]	Amazon Valley	All Other [3]	World Total [6]
1923	252,016	70,432	181,584	39,971	6,416	5,705	4,237	1,718	32,930	46,344	57,822	5,067	16,765	7,856	406,413
1924	259,706	108,524	151,182	39,997	7,697	6,699	4,621	2,962	42,446	54,497	80,347	6,688	23,165	9,065	429,366
1925	316,825	158,022	158,803	49,566	10,082	5,424	5,377	5,377	46,757	65,499	120,626	7,881	25,298	13,797	514,487
1926	391,328	151,243	240,085	58,962	9,874	9,155	6,079	4,027	52,186	71,413	121,231	8,203	24,298	16,017	621,530
1927	371,322	182,845	188,477	55,356	11,321	10,923	6,582	5,472	55,297	77,815	142,171	8,645	28,782	15,633	606,474
1928	409,430	149,787	259,643	57,267	10,790	10,087	6,698	4,813	58,848	82,511	121,770	9,548	21,129	10,690	653,794
1929	574,836	163,092	411,744	81,584	11,663	11,077	7,381	5,018	65,990	87,789	134,037	9,696	21,148	6,767	853,894
1930	547,043	133,876	413,167	76,970	10,782	10,309	6,781	4,251	69,755	79,396	115,254	7,665	14,260	5,651	814,241
1931	519,740	125,506	394,234	61,769	8,470	10,451	6,247	4,218	75,952	87,747	116,009	11,696	12,121	3,292	792,203
1932	478,252	92,539	385,713	48,973	3,888	6,960	4,664	3,451	61,312	79,837	85,871	13,883	6,450	1,816	702,818
1933	573,412	167,377	406,035	63,351	4,527	10,874	7,555	7,765	73,851	91,861	149,659	18,394	9,883	2,737	846,312
1934	677,361	211,803	465,558	79,746	10,492	17,233	11,103	17,545	87,400	112,058	175,470	20,170	8,903	2,985	1,008,663
1935	590,319	174,652	415,667	54,316	13,968	19,465	8,885	28,327	57,488	78,325	139,297	28,816	11,275	8,745	864,574
1936	520,286	167,799	352,487	49,692	14,724	21,243	8,177	33,702	61,307	84,577	152,205	40,782	14,193	11,466	845,431
1937	681,638	213,446	468,192	70,353	17,015	25,922	13,213	5,551	84,085	139,632	207,863	43,399	15,576	13,063	1,133,864
1938	526,911	156,101	370,810	49,528	15,178	17,792	9,512	41,080	57,526	94,501	145,909	58,518	14,618	12,920	887,892
1939	553,324	177,851	375,473	61,026	15,881	24,014	11,864	41,266	72,786	117,791	181,272	65,140	13,892	22,224	1,002,629
1939:															
Jan.	43,332	19,049	24,283	7,237	1,879	2,342	1,604	2,918	6,787	11,261	20,630	4,739	1,708	1,855	87,243
Feb.	43,084	13,889	29,195	5,495	1,565	1,484	664	5,606	4,833	8,410	11,752	5,659	1,056	1,754	77,473
Mar.	43,259	14,035	29,224	3,718	1,392	1,177	344	5,401	5,361	8,048	14,487	4,636	1,331	1,776	76,932
Apr.	43,658	13,996	29,662	2,225	1,260	2,446	1,687	2,660	5,321	9,250	13,768	2,581	1,139	1,753	73,751
May	42,214	12,697	29,517	2,805	1,670	1,649	558	2,782	4,105	8,168	12,155	4,585	874	1,672	70,540
June	31,541	9,567	21,974	3,708	1,435	1,157	332	1,748	5,839	8,846	12,824	4,030	591	1,825	64,309
July	45,962	20,052	25,910	5,019	1,285	3,092	1,603	5,599	5,229	11,020	19,431	3,367	1,019	1,804	84,378
Aug.	53,497	12,635	40,862	5,620	416	1,749	975	5,230	6,236	10,010	11,232	7,020	1,197	1,525	92,072
Sept.	45,094	18,302	26,792	6,064	780	1,932	429	4,670	5,168	10,278	22,270	5,943	1,131	1,832	87,289
Oct.	70,839	21,493	49,346	5,234	815	2,487	1,730	2,047	9,950	13,645	21,404	5,022	1,414	2,185	115,279
Nov.	49,276	13,657	35,619	4,405	819	2,023	1,322	1,428	5,827	10,239	14,163	6,540	1,055	2,191	85,631
Dec.	41,568	8,479	33,089	9,496	2,565	2,476	616	1,177	8,130	8,580	7,156	11,018	1,377	2,052	87,732
1940:															
Jan.	56,214	30,136	26,078	7,091	1,630	1,987	1,858	5,469	.....	.....	.....	5,315	1,777	.....	.....
Feb.	62,105	16,598	45,507	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

All figures from January, 1934, onward are net exports shown on a "dry rubber" basis as calculated by the International Rubber Regulation Committee. (1) Prior to January, 1934, Malayan net exports cannot be taken as production, since imported rubber is largely wet native rubber, which is reduced about one-third in weight by remilling; rubber exported as latex also is not included in the early years, which on a dry rubber basis was as follows: 1924—1,117 tons; 1925—3,618; 1926—3,263; 1927—2,439; 1928—2,247; 1929—3,574; 1930—2,750; 1931—1,940; 1932—5,193; 1933—10,470, and 1934—14,172 tons. (2) Ceylon Chamber of Commerce statistics until 1926; rubber exported as latex is not included—such shipments on a dry rubber basis were: 1923—18 tons; 1924—90; 1925—6; 1926—20; 1927—½; 1928—1; 1929—2; 1930—11; 1931—2; 1932—2; 1933—1, and 1934—6 tons. (3) Official statistics. (4) Exports from "Other N. I." are chiefly wet native rubber, which is reduced about one-third in weight by remilling; rubber exported as latex is not included in earlier years, which is as follows on a dry rubber basis: 1923—2,342 tons; 1924—1,008; 1925—2,239; 1926—44; 1927—84; 1928—1,395; 1929—437; 1930—2,744; 1931—3,874; 1932—3,488; 1933—5,260, and 1934—5,330 tons. (5) Calculated from official import statistics of principal consuming countries; also includes United States imports of guayule. (6) This total includes the third column for British Malaya and all other figures shown for other territories. (*) Figure is provisional.

NOTE: ANNUAL FIGURES ARE MORE ACCURATE; THEY ARE REVISED AT THE END OF THE FOLLOWING YEAR.

Net Imports of Crude Rubber into Principal Manufacturing Countries

(Long Tons)

	United States [1]	United Kingdom	France (h)	Germany	Canada (ac)	Japan (da)	Italy	Russia (ce)	Australia (cd)	Belgium (d)	Netherlands	Scandinavia (abcdf)	Spain (g)	Czechoslovakia (abcd)	World Total
1919	238,407	42,671	17,685	5,584	6,395	9,753	9,894	75	1,002	3,995	2,771	3,149	2,418	9	343,809
1920	249,530	56,844	13,885	11,890	11,746	5,297	6,123	62	1,815	3,840	5,510	2,292	2,008	567	371,409
1921	179,736	42,087	15,135	21,920	8,124	21,713	3,906	165	1,014	1,705	1,022	1,279	2,245	569	300,620
1922	296,594	11,724	24,352	27,546	9,207	15,934	6,430	2,493	2,643	172	—3,807	1,778	589	567	396,222
1923	301,527	12,700	27,392	18,519	13,277	15,372	8,489	2,986	1,649	2,184	792	2,528	630	1,128	409,173
1924	319,103	—11,550	30,446	22,727	14,299	19,571	8,764	2,346	3,124	2,688	—807	3,178	944	1,370	416,203
1925	385,596	4,061	32,956	33,937	19,683	11,117	11,412	7,088	4,757	2,930	875	3,149	1,155	1,558	520,274
1926	399,981	84,865	34,240	22,775	20,229	18,125	9,809	6,529	9,021	2,498	2,670	4,046	1,299	1,870	617,957
1927	403,472	60,249	34,271	38,892	26,405	20,521	11,381	12,018	9,490	6,482	636	4,224	2,055	2,672	632,768
1928	407,572	4,846	36,498	37,855	30,447	25,621	12,433	15,134	8,430	7,958	2,243	4,418	3,178	3,138	599,771
1929	528,608	122,675	55,093	49,275	35,453	34,284	17,169	11,774	15,886	9,445	3,022	6,440	864	4,650	894,638
1930	458,036	120,069	68,503	45,488	28,793	33,039	18,639	16,387	5,354	10,635	2,924	7,710	2,400	4,468	822,445
1931	475,993	86,170	46,466	39,688	25,261	43,483	10,149	30,671	7,649	11,009	2,220	6,360	2,605	7,717	794,641
1932	393,844	44,086	42,506	45,121	20,917	56,027	14,469	30,637	12,576	9,519	2,851	7,262	4,359	9,444	693,618
1933	398,365	73,335	61,953	54,120	19,332	66,831	19,341	29,830	13,534	11,166	1,243	7,831	5,520	10,402	772,803
1934	439,172	158,482	49,560	59,330	28,439	69,905	21,398	47,271	9,642	9,115	3,758	12,418	6,900	10,999	926,389
1935	455,758	128,829	51,450	62,899	26,870	57,567	21,880	37,572	9,978	7,593	4,068	11,878	8,140	11,245	895,727
1936	475,359	—2,591	57,032	71,794	27,871	61,223	16,534	30,967	14,109	9,648	2,888	11,236	6,668	8,772	791,510
1937	592,394	92,707	59,871	98,170	36,088	62,311	24,733	30,462	19,164	14,970	4,343	4,680	2,400	13,063	1,055,356
1938	406,343	133,079	59,660	90,200	25,696	45,836	28,170	25,650	11,944	11,309	5,092	16,034	2,400	9,936	871,349
1938:															
Aug.	31,494	12,891	3,662	7,190	1,837	2,033	2,078	739	1,182	1,238	259	965	200*	595	66,358
Sept.	34,436	8,100	5,094	7,390	1,405	3,584	1,799	1,725	1,779	519	385	1,830	200*	608	68,854
Oct.	33,830	3,085	3,791	6,326	3,139	3,204	3,921	2,000*	1,780	848	420	3,022	200*	9	65,575
Nov.	32,567	936	5,322	7,275	3,123	4,665	1,984	4,000*	660	636	530	1,209	200*	379	63,486
Dec.	37,051	4,134	5,820	7,481	2,198	4,000	2,355	2,500*	647	876	263	1,013	200*	648	69,186
1939:															
Jan.	36,614	836	4,684	7,227	2,867	2,553	2,133	4,000*	910	898	454	1,037	200*	1,131	65,544
Feb.	30,578	4,773	5,315	7,569	1,451	3,263	2,025	2,000*	1,741	1,068	184	858	200*	524	61,549
Mar.	45,286	8,082	4,503	8,036	2,458	4,019	1,525	2,000*	1,316	1,242	368	1,133	200*	463	80,631
Apr.	31,590	4,752	5,639	8,719	1,466	3,579	1,926	2,000*	1,108	855	333	1,062	200*	597	63,826
May	45,390	7,531	4,646	8,413	3,006	4,438	1,573	2,000*	1,188	792	518	1,654	200*	618	81,967
June	33,951	8,439	4,649	8,190	2,423	3,067	1,992	2,000*	1,308	621	672	2,703	200*	487	70,702
July	36,932	4,040	4,282	8,437	3,164	3,668	1,350	1,000*	1,422	859	565	824	200*	412	67,155
Aug.	38,319	2,044	4,000*	....	2,033	3,145	1,500*	2,000*	2,182	952	651	1,546	200*	400*	58,972
Sept.	36,197	4,406	4,000*	....	2,639	9,254	1,500*	2,000*	875	1,079	222	1,200*	200*	...	63,572
Oct.	39,735	8,530	5,000*	....	5,787	2,749	1,500*	2,000*	1,235	1,000*	653	1,200*	200*	...	69,589
Nov.	41,478	10,500*	5,000*	....	1,709	5,104	1,500*	2,000*	1,200*	1,000*	613	1,200*	200*	...	71,504
Dec.	70,302	5,200*	5,000*	....	2,500*	4,000*	1,500*	2,000*	1,200*	1,000*	600*	1,200*	200*	...	94,702
1940:															
Jan.	71,519	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

a—Including gutta percha. b—Including balata. c—Re-exports not deducted in monthly statistics. d—Including some scrap and reclaimed rubber. e—Official statistics of rubber imports by Soviet Russia. f—Including Norway, Sweden, Denmark and Finland. g—United Kingdom and French exports to Spain except in years prior to 1925. h—French imports have been reduced in order to eliminate imports of gutta percha and to reduce to basis of net weight. [1]—United States imports of guayule are included in this compilation. *—Figure is provisional; final figure will be shown when available.

NOTE: ANNUAL FIGURES ARE MORE ACCURATE: THEY ARE REVISED AT THE END OF THE FOLLOWING YEAR.

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